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ABSTRACT

This report, containing seven articles, summarizes a series of evaluation studies. The first article, "The Shell Science and Mathematics Resource Centre in 1987," provides an overview of the Centre's mode and reflections about the achievements of the Centre during the three years of its operation. The second article, "The Curriculum Extension Programme (CEP): Past and Present," describes the historical background and scope of the program. The next three articles deal with the evaluation of other projects operated by the Centre: "The Management Programme: Identifying Training Needs," describes the rationale and an instrument used in the program; "The Educators of Science Teachers: A Forum for Lifelong Education," deals with an endeavor to create a forum for discussing problems; "Winter School Revisited: An Evaluation Report of the 1987 Winter School," provides evaluative data about the school for grade 10 pupils. The sixth article, "Formative Evaluation of Assignments in Mathematics," describes an evaluation exercise on the mathematics component of CEP. The last article, "Early Knowledge in Communication Skills of Participants of CEP," describes the results of an entry test in English communication. (Appended is a proposed vocabulary and concept exercise for standard 8 CEP pupils.) (YP)

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Programmes & Projects of

THE SHELL
SCIENCE & MATHEMATICS
RESOURCE CENTRE
EDUCATIONAL TRUST

1987 evaluation reports

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DURBAN 1987

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PROGRAMMES AND PROJECTS OF

THE SHELL SCIENCE AND MATHEMATICS RESOURCE CENTRE

EDUCATIONAL TRUST

1987

Evaluation Reports

Edited by Dr P.M.C.Botha

DURBAN
1987

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ACKNOWLEDGEMENT

The present volume is a cooperative venture of the professional staff of the Shell Science Centre. It is the second of a series of publications which contain evaluative reports about the Centre's projects and programmes. The first volume was an evaluation study of the 1986 Winter School submitted jointly by A.Lewy, P.Botha and R.Garrib.

Professor A.Lewy from Tel Aviv University visited the Shell Science Centre on two occasions, in 1986 and in 1987 and his visits at the Centre served as catalysts for the whole team to examine their own work and to use evaluation studies for improving their programmes. The present volume reflects such attempts on behalf of the professional staff.

The Centre was fortunate to have the skilful services of Ulla Bulteel in carrying out the work of data analysis. Finally, the editor of this volume and the authors of the articles wish to express thanks to Iona Laing for her patience in typing the articles, and retyping the articles whenever the authors felt need to change paragraphs and pages in their reports. Her careful reading of the articles was also helpful in eliminating numerous errors, omissions and inconsistencies in the original manuscripts of the authors.

Durban, August 1987

Dr P.M.C.Botha Director
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Overview of the Report

The present volume contains summaries of a series of evaluation studies carried out at the Shell Science and Mathematics Resource Centre Educational Trust in 1987.

The introductory chapter presented by Dr P.M.C.Rotha, the Director of the Centre, provides an overview of the Centre's mode of operation and reflections about the achievements of the Centre during the three years of its operation.

Three articles deal with various features of the Curriculum Extension Programme (CEP) which is one of the most promising compensatory education programmes of the Centre. Garrib contributed an article which describes the historical background of the project and its present day scope.

Luthuli's article describes a formative evaluation exercise related to two work assignments included in the mathematics component of CEP. His article illustrates attempts made by the Centre to improve the quality of the instructional materials.

Ziervogel's article describes the results of an entry test in English communication administered to the participants of the CEP.

Three articles deal with the evaluation of other projects operated by the Centre. Gumbi describes the rationale of the Management Training Programme and presents an instrument which will be used for revising the content of the programme.

Hobden's article deals with a successful endeavour of creating a forum where the teachers of science teachers can discuss problems encountered in the process of their work.

Finally Lewy's article provides evaluative data and comments about the 1987 Winter School which was attended by approximately 500 Standard 10 pupils.

THE SHELL SCIENCE AND MATHEMATICS RESOURCE CENTRE EDUCATIONAL TRUST IN 1987

Dr P.M.C.Botha

Roots in the Ideals of the Business and the Academic Community

The operational philosophy of the Shell Science and Mathematics Resource Centre Educational Trust is rooted in the ideals of its founders: Shell South Africa (Pty) Limited.

The Centre is one of the institutions in the Republic of South Africa which strive to implement the Shell South Africa's social policy, as it is spelled out in detail in one of its recent publications "Everyone has the right to equal educational opportunity" (Shell South Africa Business Report 1986).

The Centre is fully funded by Shell, but it is administered by an independent Board of Trustees.

As indicated in the above mentioned report "Its primary objective is to attempt to redress the educational deficiencies and the lack of opportunities in a system which has entrenched in unequal and differential education for decades" (p. 82). It focuses on providing in-service training for black teachers and direct supplementary teaching for black secondary educational pupils.

Being located at the campus of the University of Natal , the Shell Science and Mathematics Resource Centre Educational Trust is sensitive to the social and academic ideals of the University which aims to serve the community through excellence in teaching, scholarship and research.

The Centre strives to assist the higher educational institutions in realising some of the goals set for the disadvantaged learners (University of Natal 1985).

These goals are:

- identifying those who have potential to benefit from university study;
- upgrading the quality of teaching in the schools which provides schooling for the disadvantaged social groups in South Africa;
- carrying out research programmes to provide knowledge how to attain the previously mentioned goals.

The Unique Characteristics of the Centre

The Shell Science and Mathematics Resource Centre Educational Trust started to operate in 1985. In practical terms it can be defined as a compensatory educational-intervention project, and in this capacity it operates, together with numerous other compensatory intervention projects, to improve the achievement levels of school pupils from disadvantaged social groups. The educational philosophy of the Shell Science and Mathematics Resource Centre Educational Trust shares values and operational practices with many other educational intervention projects. Nevertheless two unique characteristics of the Centre merit mentioning. Firstly it strives to deal intensively with the needs of the individuals enrolled in its programmes, and secondly it continuously makes efforts to improve the quality of its programmes by systematic evaluation of activities and by meticulous examination of trends and developments across the world in the field of compensatory educational programmes.

The intensity of the Shell Science and Mathematics Resource Centre Educational Trust's programmes is facilitated by the fact that the centre operates small group tutorial programmes for high school pupils. Most such groups consist of 10 pupils coming from various schools, and according to the Centre's plan some study groups are expected to receive tutorial instruction during a period of three years, starting at the standard 8 level and continuing through to the end of standard 10 level.

It is a hope that studying in a small group for a period of three years with the same tutor will contribute not only to raising the achievement level but also to shaping cohesive study groups within the framework of which the course participants will provide support to each other, and the tutor will develop responsibility for taking care of the unique study needs of each particular student. The Centre attributes great significance to these characteristics of the course and it expects that the combination of these three qualities, i.e. small group, long duration, and the leadership of a tutor during an extended period of time will result in cognitive, affective and social gains.

The second feature of the Shell Science and Mathematics Resource Centre Educational Trust is a continuous effort to improve its programmes. In this respect it operates as a research and development institution. The team members of the Centre develop instructional materials, examine the quality of the materials and continuously improve them and also improve other components of the programmes, such as the teaching strategies, the organisational features and the overall study climate.

As already indicated the Centre is located at the campus of the University of Natal, and being associated with such a distinguished institution constitutes a challenge. It has to live up to the expectations of its host institution, and has to adopt academic standards. The quality of the Centre's work, its openness to learn

from experiences of other compensatory education programmes, its involvement in research and evaluation of activities with the aim of producing knowledge, which can be used by others, too, have gradually developed recognition for the Centre's work in various circles of educational leadership.

The Clientele of the Centre

The Shell Science Centre started its operation by providing educational programmes for senior secondary school pupils from disadvantaged social strata, who were identified as having potential to be admitted to institutions of higher education, but needed supplementary tutoring for realising this potential, and for being able to cope with the highly challenging, intellectual demands of studying in such institutions. Agencies operating compensatory educational programmes frequently face the dilemma of selecting the target age group for their activity. Some agencies are inclined to focus on programmes for the preschool age-group. The reason for this is that at that age the educational deficit of the disadvantaged groups is smaller than in a later age. Also an intervention at the early age allows provision of compensatory education for several years, and thus there are increased chances that the programme will be effective.

The Shell Science Centre opted for selecting the secondary school age group. It did so because this group of pupils will face, within a short period of time, the dilemma of entering the labour market or continuing their studies in institutions of higher education. Since the Shell Science Centre is aware of the current shortage of highly skilled professionals in technology, and of the scarcity of such persons in the Black population, it decided to provide support for those who within a relatively short period will be called to make crucial decisions with regard to their future occupation.

The Shell Science Centre operated on the basis of the assumption that those secondary school pupils who receive tutoring within the framework of the Centre's compensatory programme within a few years will enter as skilled professionals into the labour market. Thus they may contribute to the alleviation of the shortage of needed technological professionals and also may experience an upward mobility in the occupational scale. Their personal success may also contribute to rectifying a social injustice.

The Centre employed two strategies in dealing with the needs of secondary school pupils : direct tutoring and in-service training to their teachers. Some secondary school students benefitted from both intervention strategies : they themselves could participate in the tutoring classes and the teachers of their regular classroom had an opportunity to improve their teaching practice through participation in the INSET programmes. The efforts of tutoring and of in-service training have been directed towards the science subjects. Thus the Centre remained faithful to its mission of strengthening the standard of studying science and increasing the love of science subjects.

These two strategies of compensation have been employed by the Centre from the very beginning of its operation up to the present day, and it is the Centre's policy to continue its activities along these two lines. Moreover the scope of activities has increased both in the area of direct tutoring and in in-service teacher training. Nevertheless in the future it is projected to increase the scope of activities in the domain of in-service training of science teachers, and to slightly reduce the scope of teaching secondary school pupils directly. The trend to increase the activities in the domain of in-service training is justified by practical reasons. The multiplication effect associated with teacher training may precipitate change. One teacher usually teaches several hundred students in various classes. On the other hand the Centre's ideal is to continue to work with secondary school pupils directly, too. Such work may have multiple benefits. First, it may serve as a source of useful information for planning in-service training programmes. The tryout of innovative instructional materials and teaching strategies in such groups, and experiences of the tutors accumulated in this context may provide important input for improving the quality of science teaching. Secondly the direct tutoring of secondary school pupils facilitates contact with a new generation of young people who more easily than their teachers can bring the message of the Centre to their peers. Finally a support given parallelly to teachers and to their students may be additive, and if it is provided to a selected group of able students and to devoted teachers it may produce a highly significant effect.

From Early Childhood to College Level

Though the major thrust of the Centre is the group of secondary school pupils who take extended courses in science, the activities of the Centre transgress the narrow boundaries of dealing with a single age group. The secondary school has been defined as the target population of the Centre, but the actual contact population is partly above the target age-group and partly below it. The focus on in-service training programme for secondary school teachers was already mentioned. In 1987 the Centre succeeded in reaching out also to a group of more advanced level educational professionals and it was instrumental in creating a lifelong education framework for college teachers engaged in training science teachers. This initiative is described in another article of this publication. In this context it suffices to say that in practice the educational needs of an age-group can not be fully separated from the educational needs of other age groups.

The activities of the Centre became extended towards dealing with the needs of lower age group students, too. In-service activities have been carried out for primary school science teachers, too. Moreover recently, on experimental basis, an innovative programme for pre-school teachers was launched with the aim of promoting the teaching of some rudimentary elements of science and patterns of scientific thinking at the pre-school level. It is a hope that as a result of more adequate training activities pupils entering secondary schools will be better equipped to cope with the requirements of

science courses. Higher level readiness matched with better trained teachers may significantly increase the success of secondary school students from disadvantaged social strata to pass matriculation examination.

Democratic Climate and Community Involvement

The educational philosophy of the Shell Science Centre emphasises the importance of creating a democratic climate in which the staff members as well as tutors are given opportunity to participate in the decision making process, suggest innovations, implement changes and test experimental approaches. The democratic climate is extended to the student body too. The participants of the lessons, both high school students, and teachers are invited to express their views, and to challenge each other and their tutors.

In the past several compensatory educational projects tried to disseminate and implement 'imported' programmes. Such 'top down' innovative attempts have not proved to be successful, and mostly have not produced real changes. The innovations have not filled the needs of the clientele, the tutors have not internalised the ideas of the innovation, and so they were unable to motivate their students. The Shell Science Centre's philosophy is based on cooperative planning. The central staff members are engaged in systematic studies to identify educational needs of various groups. They plan the programmes in collaboration with tutors and they encourage tutors to use these programmes in a creative way. The tutors are invited to be creative partners of the planning, rather than passive users of materials handed over to them. The secondary school students, too, are encouraged to take initiative in the class, to discuss their problems, to express their opinion and to integrate what they learned in the course with experiences they have accumulated outside the course.

The democratic climate is expanded to other stakeholders of the programme, too, and not only to its direct participants. The support of the community is considered to be of great value and the Centre could not been able to operate in urban and rural locations, far away from its central office, without the involvement and the support of various community agencies. The ability of the Centre to recruit community support for its activities can be considered as a highly significant success. It required a systematic effort of two years to secure such support. Contact was made with those community agencies, organisations, associations, etc. whose work has been related in one way or another, to matters of education. This was not an easy task. In several instances the Shell Science Centre served as a catalyst to bring together various social agencies, who have not met previously and by involving them in its educational programme it also paved the way for cooperation among them in other areas of life, too, which are not related to matters of education.

The Centre is aware that it is not enough to create involvement. Without skillfully maintaining such involvement, it may easily dwindle and fade away. Therefore it invests great energy in kindling the involvement, and channelling it towards fruitful directions. By no means does the Centre satisfy itself with the present situation. It strives to achieve more, to identify more organisations which may provide support, to increase the involvement of those who already committed themselves, and also to recruit the help and the support of those individuals who have not been members of organised bodies.

There is a constantly growing body of individuals whose involvement in the Centre's work may constitute an invaluable resource of support. These are the group of alumni; teachers who benefitted from some activity of the Centre, and young adults, who in the past as secondary school students participated in compensatory education programmes. These group of individuals could be organised into a meaningful supportive body for the Shell Science Centre.

There are plans to produce a Newsletter which will be regularly disseminated among the alumni. Such a newsletter could serve as a two way communication channel between the Centre and its alumni. It could give place to the ideas of the alumni, record personal, social and professional progress of the alumni, and should contain information which may be useful for various groups of the alumni.

The Centre faces the challenge of creating such a two way communication channel with a group which may grow into a highly enthusiastic body of supporters.

The Shell Science Centre Five Years from Now

Those who participated in shaping the Centre from the beginning of its establishment, look back with a feeling of satisfaction. The Centre established itself as a viable institution in the field of compensatory education, and in gaining prestige as an institution which made some contribution to the improvement of the Black education in Natal.

But after an eventful history of three years, it cannot indulge in idleness and should not be content with what already has been attained. It faces new challenges and their realisation may require more effort, better coordinated team work, higher level of creativity, more initiative than what the Centre has been able to manifest hitherto.

Institutions operate best if they have a long range vision about what they would like to achieve, and at the same time they also prepare short range plans for what they perceive as a feasible and realistically attainable goal.

The Shell Science Centre is lead by a vision about the future. Rooted in the ideals of Shell South Africa Limited and the University of Natal it would like to uplift the "Black" educational system in Natal

to a level, which will facilitate its smooth integration into the post-apartheid society. Its present efforts, however, are directed toward a more modest attainment, which it hopes to accomplish in the forthcoming five years. Its short range goal is to provide effective in-service training for approximately 70% of secondary school science teachers in Natal. At present it concentrates its efforts on realising its short range goals. The Shell Science Centre established four regional centres across Natal. People working at these regional centres are engaged in creating visibility for the Shell Science Centre's activities, enlisting support and recruiting resources.

The criterion for evaluating the success of the Centre and of judging its viability is the Centre's ability to realise its short range goals and after attaining these goals its ability to set another set of new short range goals, which eventually will lead forward to the integration of the Natal and Kwa Zulu Black educational system in the post-apartheid society.

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The Curriculum Extension Programme

R. B. Garrib

Background of the Programme

Historically, the Curriculum Extension Programme commenced in 1983 as the University Preparation Programme (UPP) designed by United States Agency for International Development (USAID) for assisting black matriculants in RSA. In its original implementation by the Urban Foundation instructional materials developed by United States Educationists formed the basis of the tuition programme. The materials were based on the Joint Matriculation Board's syllabus and prescribed a methodology based on P.S.I. (Personalised system of Instruction).

This "top down" type of attempt to introduce an educational change in the classroom situation has not been very successful. The teachers were not sufficiently responsive to the methodology and did not feel at ease to use the materials given to them in the way prescribed. Consequently the Urban Foundation established learning or tuition centres where tuition was provided to all students who were interested in obtaining some supplementary teaching to that which they received in their regular classes. Attendance was erratic and problems of organisation and administration affected the success of this endeavour.

In 1985 the Curriculum Extension Programme was initiated by the Shell Science Centre to some extent with similar goals to those espoused by the Urban Foundation. Both projects were designed to assist pupils from disadvantaged educational and social background to succeed in passing the matriculation examination well. The operational philosophy of the Shell Science Centre was different from that of the Urban Foundation in that the Shell Science Centre adopted an approach of mutual responsibility. Rather than operating a programme open to all pupils it established criteria in selecting pupils for the programme. Students were requested to register and to attend on a regular basis. It demanded a commitment on the part of the students to exhibit perseverance in their studies and the project committed itself to provide services to the students. Liaison was established between the class teachers of the pupils and the tutors appointed by the Shell Science Centre. The teacher to pupil ratio was also reduced to an average of 1:12. To a large extent the relationship between the tutors and the students has developed into a kind of individual contact, which deepened during the time, due to the fact that the study group contained a relatively small group of students.

Secondly, the Shell Programme was not operated in a "top down" manner. The Centre's permanent staff designed a course and prepared instructional materials, discussed various aspects of using these materials with the tutors, and encouraged tutors to adapt these materials to the unique needs of their pupils, and also to complement these materials. Thus the tutors have been not only users of

materials handed over to them but they became partners in the process of deciding what should be taught in the courses.

Thirdly, the content of the courses has not been strictly syllabus oriented. The Centre's staff as well as the tutors have felt free to deviate from the formal school syllabus by introducing topics of enrichment, to increase the students interest in the subjects of their studies.

Fourthly, at the courses a 'tutorial' rather than a expository teaching approach has been encouraged and syllabus based work has been often substituted by activities specially designed by subject coordinators. The active participation by pupils has been strongly advocated.

The first Curriculum Extension Programme of the Shell Science and Mathematics Resource Centre Educational Trust was implemented in 1985 with Standard 9 pupils from three schools in Umlazi, three in Kwa Mashu, three schools in Phoenix and four schools in Sydenham. This was continued in 1986 in the students' final matriculation year in Standard 10.

An Evaluation of CEP in Kwa Zulu

The Shell Science Centre collected data about the success in the matriculation examination of pupils participating in the CEP. It was found that of the 91 participating pupils 78 obtained Senior Certificate passes; 45 (50%) obtained matriculation exemption entitling them to apply to Universities and 33 (36%) straight Senior Certificate passes.

As already indicated the CEP was run at two Centres in Kwa Zulu. Of 48 students in Kwa Mashu 38 passed Senior Certificate (24 with matriculation exemption) and 14 Senior Certificate.

In Umlazi 43 pupils wrote the Senior certificate examination and 40 passed (93%), (21 with exemption and 19 Senior Certificate passes).

While it is difficult to claim credit for this achievement owing to other variables in the teaching-learning situation, the results were encouraging as in the 2 Kwa Zulu Centres, 76 pupils (83,5%) passed mathematics and 76 pupils (83,5%) passed physical science with a total of 40 failures in both subjects (13%).

In mathematics there was one distinction, (A), there were 5 Bs and 7 Cs. In Physical Science there were 3 Cs and 13 Ds.

Tuition was also provided in English and the percentage pass was 73% with 4 Bs and 13 Cs (17 failures). (One of the students did not sit for the English examination).

The 1987 CEP

In 1987 the duration of the cycle of the CEP programme was extended to include Standard 8 pupils, while in the previous years standard 9 pupils were admitted to the programme. Thus a single cycle will have a duration of three years. This longer period of study will enable tutors to deal more deeply with learning problems encountered by the students. It also will enable greater flexibility in including in the programme more enrichment topics. It is hoped that during the three years study course there will be a possibility to create a less formal learning climate, and the tutors will feel free to go beyond what is strictly prescribed in the official examination syllabi.

An additional innovation of the 1987 CEP is a strong emphasis on teaching communication skills in English, which is the medium of the instruction in black schools as well.

The mastery of communication skills, which constitutes the school's medium of instruction, is a precondition of success of studying science and therefore a course was specifically designed to assist the pupil in acquiring these skills.

Table 1 contains information about the scope of the 1987 CEP.

It can be seen that at the Durban area there are four study centres. Two additional Centres are operated outside the Durban area.

Table 1. The 1987 CEP centres

Centre	Pupils	Groups	No of Tutors (all subjects)	No of Schools
Durban area				
Umlazi	37	3	9	4
Swinton	36	3	9	3
V N Naik	56	4	12	5
Toncoro	20	2	6	2
Newcastle	45	3	9	4
Greytown[1]	20	1	3	1
All	214	16	48	19

1. At Greytown no courses are run in Physical Sciences, instead the subjects Technical Drawing and Biology are offered.

Altogether 214 pupils from 19 schools registered for the 1987 CEP. The list of schools participating in the CEP are contained in Table 2.

Table 2. List of the CEP Schools

The Centre	The School	No of pupils in CEP
Umlazi	1.Igagasi	10
	2.KwaShaka	9
	3.Ogwini	9
	4.Zwelibanzi	9
Swinton	1.Lamontville	13
	2.Chesterville	12
	3.Fairvale	11
V.N.Naik	1.J L Dube	14
	2.Newlands West	12
	3.Newlands East	10
	4.Nqabakazulu	10
	5.Zeph Dhlomo	10
Toncoro	1.Zakhe	10
	2.Isibonelo	10
Newcastle	1.Lincoln Heights	15
	2.Madadeni	30
Greytown	1.Buhlebuyeza High School	20

Transport

To ensure punctuality and regular attendance the Centre provides transport for all pupils from schools to the Centre of study and return to central points in their townships.

The Shell Science Centre plans to collect systematic data about the progress of the students participating in the CEP in order to evaluate the success of the programme.

The Management Programme : Identifying Training Needs.

E. B. Gumbi

The Background

Concern about the crisis situation in Black education in South Africa has resulted in the emerging of a number of compensatory education programmes. These compensatory education programmes are directed either at the pupils or teachers. The pupil oriented compensatory education programmes aim at enriching the curriculum. The teacher oriented programmes take the form of in-service education and training. It is assumed that the teacher oriented programmes have a multiplying effect over and above the personal growth and development of the individual teachers.

Some diversification has occurred in the teacher oriented compensatory programmes. While in-service education and training programmes have been conducted in school subjects like Mathematics, Physical Science, Biology, English, etc. some agencies, organisations and institutions like the Urban Foundation, Teacher Opportunities Programmes, Research Institute of Educational Planning of the University of the Orange Free State, Shell Science and Mathematics Resource Centre Educational Trust, to name a few, have designed programmes for school administrators.

The Shell Science and Mathematics Resource Centre conducts Educational Management courses for principals of post primary schools specifically except only in cases where a request has been put for conducting a course for the principals of primary schools in KwaZulu.

The need for management courses for post primary schools was expressed by the KwaZulu Education and Culture Department to Shell Science Centre.

Theoretical Considerations for Planning a Management Programme

While the Shell Science Centre is not oblivious to the constraints under which the principals of schools in the KwaZulu Department of Education and Culture function and operate, the need for the Educational Management Programme is based on the following considerations:-

a. The work of the principals is demanding in terms of the task as well as the human dimensions.
b. The understanding of the management processes would help in appreciating the needs of teachers and pupils in the schools and how to work with and motivate them.
c. The realisation of the goals of the school in particular and those of the education department in general depends on the ability of the principal to lead effectively.
d. The task of the principals is not made easy because of the political, social and economic environment in which the schools operate.

e. There is no training in school management and administration offered to the newly appointed principals in order to initiate them to the demanding and arduous tasks of managing a school.
f. The vast teaching experience of the principals is a factor in helping them to cope with the demands of the job.
g. The understanding of how the education system operates and functions helps in coping with the demands of the job.

Principles of Management

The theoretical presentation of management (see Fig. 1) as a "process of planning, organising, leading, and controlling the efforts of organisation members and of using all other organisational resources to achieve stated organisational goals" (Stoner and Wankel, 1986 p.4,) leads to the exposition of

- the management processes viz. planning, organising, leading and controlling;
- elements of management viz. decision making, communication, motivation and coordination; and
- subordinate actions of management viz. objective formulation, budgeting, delegating, evaluating, feedback and reporting.

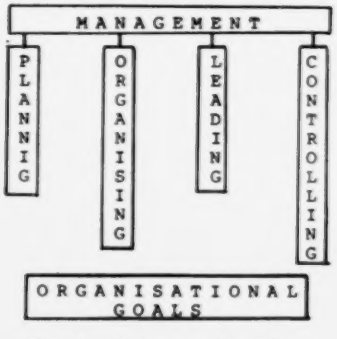

Fig. 1. Management Functions

In the Planning process, the principal/manager sets out the objectives of the school and the best procedures for reaching these objectives. Decision making (see Fig. 2) is involved in the planning process as the principal establishes the goals for the school, for each department, for each subject, etc. The principal considers the teachers as members of the school who will carry out the various activities consistent with the chosen objectives and the procedure. The procedures spell out how progress in attainment of the objectives will be monitored and measured so that corrective action can be taken if progress is unsatisfactory.

Organising (see Fig. 2) involves the identification, classification and grouping of activities to be performed in the light of resources and situations; definition and delegation of responsibility and authority, and the establishment of relationships for the purpose of enabling people to work most effectively in accomplishing objectives (Koontz et. 1984). The principal should aim at formulating an organisational design which will meet the expectations of the school and the personal needs of the teachers as well as the pupils.

His/her job description as well as those of the teachers are his/her responsibilities. The job descriptions are specific responsibilities of each member of the staff and they also determine standards for measuring performance of the activities assigned to the teachers. Staffing is an important facet of organising as the principal cannot perform all the activities of the school. Staffing involves the recruitment, placement and training of qualified personnel to perform tasks of the organisation.

Personal needs and institutional expectations influence the behaviour of individuals. Conflict occurs in the organisation when people are dissatisfied. Dissatisfaction is caused by interpersonal relations with peers, superordinates and subordinates, supervisions, policy and administration, salary, status, security and working conditions. Satisfaction is caused by achievement, recognition, challenging work, responsibility and opportunity for advancement.

Leading is a process of influencing people so that they will strive willingly and enthusiastically toward the attainment of organisational goals (Koontz et al p. 460, 1984). The process of influencing involves motivating, considering groups, actuating and communicating. Leading involves directing people within an organisation. It is probably for this reason that management and leadership are often thought of as the same thing (see Fig. 2).

Controlling involves the establishment of standards of performance, the measurement of performance and comparison against the established standards; and taking remedial action to correct deviations. Controlling assures that actual activities conform to planned activities. The main purpose of controlling is to help staff perform better so that the organisational goals may be achieved (see Fig. 2).

Principals like all managers need human, technical and conceptual skills. Technical skills involve using specialised knowledge and expertise in executing work-related techniques and procedures. In managing the finances (funds), of the school book-keeping or accounting knowledge is required. Technical skills are related to working with 'things', processes or physical objects. Human skills relate to building cooperation within the team being led.

This involves working with attitudes, communication, individuals and groups. Conceptual skills involve the ability to see the organisation as a whole and be in a position to integrate and coordinate all its activities. Conceptual skills help the principal to better understand how various functions of the school complement one another, how the school fits in the circuit and how the school relates to the Education Department.

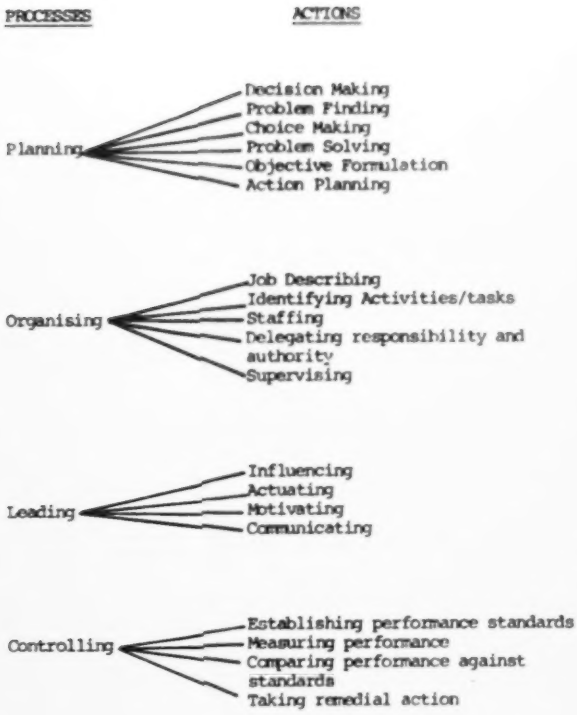

Fig. 2. Specific management tasks

The Programme

The Purpose

The main purpose of the programme is to improve the managerial skills and the leadership of the principals. Effective leadership of the principals will be demonstrated in the manner they will influence the subordinates' perceptions of work goals, personal goals and paths to goal attainment. They will encourage participatory decision making among their subordinates, maximize the use of abilities of both teachers and pupils; increase, enhance and facilitate personal responsibility for individual learning among pupils (Wood et al p. 62, 1985).

It is envisaged that the programme will help the principals to develop an attitude that they are the key facilitators of high quality education. They will help to provide the proper climate to maximize learning opportunities. They will assume their roles as human leaders for developing a school environment that will create a sense of self worth among their pupils.

The objectives are to provide an opportunity for principals to:

- o acquire knowledge with regard to Educational Management;
- o develop skills and attitudes with regard to Educational Management;
- o identify and understand their managerial roles;
- o perceive school problems as a challenge to them;
- o talk about themselves and their work experiences.

The Contents

The following aspects form the contents of the Management programme:

School Management
Planning
Organizing
Leading
    Communication
    Motivation
    Decision-making and Problem Solving
Controlling

Organisational Aspects

Venue

All programmes are run in hotels because programmes are residential and most hotels offer conference facilities. Hotel bookings are made by the Administrative Officer.

Support

Department of Education and Culture

The local Circuit Inspector of Education of the principals invited to participate at the course is requested to lend his support to the course by advertising the course. The schedule for the year's activities is submitted to the Secretary for Education and Culture for information.

University of Zululand

The lecturing staff in the Department of Educational Planning and Administration have offered their services to tutor in the course.

Natal African Teachers' Union

The Professional Secretary of the Natal African Teachers' Union is giving support to the course by attending the courses to give encouragement to the participants.

Time Schedules

The programme of activities during the three day initial residential course is divided into two hour slots which are allotted to each of the principles of management.

The Participants

The course participants are at present the principals of secondary and post-primary schools except in cases where a request has been made to conduct a course for primary school principals. The Shell Science Centre course focuses its activities on teachers and pupils in the secondary school phase, hence principals of the secondary schools are the main consumers of the Educational Management programme. The management of secondary schools seems to pose problems to most principals, probably because of the type of 'student and teacher' they deal with; interest in secondary school shown by the public (i.e. educational institutions, private sector etc.) and the diversification in educational process at the secondary school level. These pressures as well as those of the education system itself place a heavy demand on the principal who has to function and live up to high expectations. Most of the principals operate and function with limited or no resources at all. As most of their schools are community schools, they have an additional task of seeing to the provision of physical facilities.

Examining the Needs of the Clientele

Perceptions of Principals

The three day initial course deals with Management and introduces participants to a number of processes. Undoubtedly the course is designed without any perceptions from the participants. It is assumed that the initial course will help to raise the level of awareness. Furthermore it is envisaged that the principals will be in a better position to articulate their needs. The articulation of needs would then lend relevance to any future course designed.

The Questionnaire

The questionnaire on the Opportunities for Professional Development for Principals of Secondary Schools (OPDPSS) was designed with a purpose of discovering the views of the secondary school principals about the content, form and/or setting of their professional development. The questionnaire is based on the Survey of Opinion conducted by Yates in the Wakefield Local Education Authority in Britain in 1979.

The OPDPSS tries to establish :

a. what areas of knowledge and skills are important for the professional development of principals;

b. what degree of importance is attached to these areas and skills;

c. what methods of learning i.e. forms and contexts of development are considered acceptable and successful in the professional development process;

d. how acceptable and successful these methods are.

The questionnaire is divided into three parts. Part I consists of seven items on personal information of the respondents. The seven demographic variables are school's name, circuit, department, age, sex, qualifications (academic, professional, additional training) and experience in years as teacher, and as principal. Part II consisting of 52 items is further subdivided into five sub sections viz:

A. Basic knowledge, about the school's own situation (items 1 to 10). This refers to knowing the basic facts about the current state of the school.

B. General Professional knowledge and understanding (items 11 to 18).
These items refer to knowing and understanding the organisation and the system in which the school functions.

C. Problem solving and the Technical skills of running schools (items 19 to 30). These items attempt to establish skills which can be used for processing information and analysing.

D. Interpersonal skills involved in running schools (items 31 to 43).
These items refer to the abilities and skills which help one to respond to situations as they occur and to enrich one's basic information and understanding. Furthermore, reference is made to skills of leadership; influencing, communicating, using and responding to authority, and skills for working with and through people.

E. Personal skills and qualities involved in running schools (items 44 to 52).
These items pertain to affective and emotional qualities. These are the abilities to respond to situations with sensitivity yet with enough self control to keep calm; to act with some purpose or goal to achieve; to be proactive; to show professional qualities of dedication, commitment, and willingness to accept responsibility for things to happen.

Part III of the questionnaire consists of 13 items which refer to forms or contexts of activity and their being particularly acceptable and successful, or particularly unacceptable and unsuccessful for the professional development of principals.

Method of Scoring
Part II items of the questionnaire will be scored as follows:

Response	Definition	Score
1	Very important	3
2	Of above average importance	2
3	Moderately important	1
4	Not important	-1
5	No opinion	0

The highest possible average score for any item will be 3,00. This will indicate a unanimous view that the item is very important. An average score of 0,00 will indicate a form neutrality either because of an absence of opinion, or because the same number thought the item moderately important as thought it not important. Positive scores will be interpreted to show recognition of importance descending from very important (unanimity) (3,00) to neutrality (0,00). Negative average scores (-1,00) will indicate in varying degrees that the items are not important.

Part III items of the questionnaire will be scored as follows-

Response	Definition	Score
X	Particularly acceptable and successful	1
Y	Particularly unacceptable and unsuccess -ful	-1
Z	No opinion	0

The highest possible average score for any item will be 1,00. This will indicate a unanimous view that the item is particularly acceptable and successful. An average score 0,00 will indicate a form of neutrality i.e. because of an absence of any opinion; or because the same number thought it particularly unacceptable and unsuccessful, or because of a combination of both. Positive average scores will be interpreted to show a recognition of acceptability and success descending from a unanimous particularly acceptable to successful (1,00) to neutrality (0,00). Negative average scores will indicate that items are regarded as unacceptable and unsuccessful.

The Respondents

The principals participating in a three day programme will be requested to complete the questionnaire which will be distributed on the third day of the programme. After completion the questionnaire it will be collected.

The Summary of Responses

The responses for both Parts II and III of the questionnaire will be summed and percentages will be computed. Average scores for both parts of the questionnaire will be computed for each group of participants.

Rank Ordering

The following will be ranked:

- o average scores of five areas in Part II of the questionnaire;
- o individual items in the five areas of Part II of the questionnaire;
- o 13 items of Part III of the questionnaire.

Correlation

Pearson's Product Moment Correlation Coefficients for each item with the total score of the relevant cluster of items will be computed.

Utilization of the Results

The results will help in giving direction to the future programmes in Management. As participants' needs will be expressed it will be possible to address the specific needs, using the form of developing (methods) most preferred and acceptable to the participants.

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APPENDIX A
QUESTIONNAIRE

THE SHELL SCIENCE AND MATHEMATICS RESOURCE CENTRE EDUCATIONAL TRUST

OPPORTUNITIES FOR PROFESSIONAL DEVELOPMENT FOR

PRINCIPALS OF SECONDARY SCHOOLS

PERSONAL INFORMATION

1. School's Name: .....

2. Circuit : .....

3. Department : .....

4. Age : .....

5. Sex : MALE / FEMALE

6. Qualifications : .....

   6.1 Academic : .....

   6.2 Professional: .....

   6.3 Additional Training: .....

7. Experience in Years:

   7.1 As Teacher: .....

   7.2 As Principal: .....

THE SHELL SCIENCE AND MATHEMATICS RESOURCE CENTRE EDUCATIONAL TRUST

OPPORTUNITIES FOR PROFESSIONAL DEVELOPMENT FOR

PRINCIPALS OF SECONDARY SCHOOLS

PART 1

Against each of the items 1 - 52 below please put a tick in one of the boxes to show how important you think it is as an area in which should be opportunities for learning and development for principals of secondary schools.

1 Very Important
2 Of above average importance
3 Moderately importance
4 Not important
5 No opinion

1 - 10 Basic Knowledge about the school's own situation.

							For Office Use
1.	Knowledge about the procedures of the Circuit office	1	2	3	4	5	
2.	Knowledge about the roles of the Inspectorate	1	2	3	4	5	
3.	Knowledge about the Department of Education and Culture	1	2	3	4	5	
4.	Knowledge about the work of the N.A.T.U. A.T.A.S.A., and other educational bodies	1	2	3	4	5	
5.	Knowledge about the work of other schools in your circuit	1	2	3	4	5	
6.	Knowledge about the areas of tertiary and Higher Education into which pupils may move	1	2	3	4	5	
7.	Knowledge about supporting services such as Psychological Services, Library Service	1	2	3	4	5	
8.	Knowledge about employment opportunities	1	2	3	4	5	
9.	Knowledge about the local community	1	2	3	4	5	
10.	Other basic knowledge about the school's own situation : please specify	1	2	3	4	5	

11 - 18 General Professional Knowledge and Understanding						For Office Use
11. Assessment, testing and Examinations	1	2	3	4	5	
12. Curriculum development and evaluation	1	2	3	4	5	
13. Resources and educational technology	1	2	3	4	5	
14. Social Organization of schools and guidance systems	1	2	3	4	5	
15. Discipline, renewals, punishment, dealing with disruptive behaviour	1	2	3	4	5	
16. Law relating to education	1	2	3	4	5	
17. Educational Management theory and practice	1	2	3	4	5	
18. Other areas of professional knowledge and understanding : please specify	1	2	3	4	5	
	1	2	3	4	5	
	1	2	3	4	5	
19 - 30 Problem-solving and the Technical Skills of Running School						
19. Setting of a school's aims and objectives	1	2	3	4	5	
20. Planning and controlling the use of resources, including manpower, buildings and finance	1	2	3	4	5	
21. Producing action plans	1	2	3	4	5	
22. Collecting and interpreting statistics and other data and maintaining an overall assessment of the school	1	2	3	4	5	
23. Investigating incidents	1	2	3	4	5	
24. Communicating effectively by using telephones writing letters and papers	1	2	3	4	5	
25. Managing one's own time and accessibility	1	2	3	4	5	
26. Keeping oneself fit	1	2	3	4	5	
27. Managing conflict	1	2	3	4	5	
28. Managing one's thoughts	1	2	3	4	5	

						For office use
29. Updating one's basic and professional knowledge	1	2	3	4	5	
30. Learning other technical skills	1	2	3	4	5	
Please specify	1	2	3	4	5	
	1	2	3	4	5	
	1	2	3	4	5	

31 - 42 Interpersonal Skills involved in running schools

31. Exercising leadership, influencing, communicating and maintaining morale	1	2	3	4	5
32. Choosing staff (advertising, interviewing etc.) defining roles and delegating	1	2	3	4	5
33. Working with large and small groups; conduct of meetings	1	2	3	4	5
34. Participating; consultation; decision-making	1	2	3	4	5
35. Crisis management	1	2	3	4	5
36. Developing and maintaining teacher-pupil relationships	1	2	3	4	5
37. Assessing performance of pupils	1	2	3	4	5
38. Counselling and welfare of pupils	1	2	3	4	5
39. Assessing performance of staff	1	2	3	4	5
40. Counselling and welfare of staff	1	2	3	4	5
41. Managing staff development and training	1	2	3	4	5
42. Maintaining communication with people and organizations outside the schools (other schools, etc., agencies, police, parents, kings, community, magistrates, social workers, medical and para-medical staff, etc.)	1	2	3	4	5

						For office use
43. Learning other inter-personal skills; please specify:	1	2	3	4	5	

44. - 52. Personal Skills and qualities involved in running schools

44. Emotional resilience and self-control, working effectively. Under pressure, without panic	1	2	3	4	5
45. Sensitivity to events and emotional issues without defensive cutting off	1	2	3	4	5
46. Sensitivity to forces acting on the school from outside and response to changes in these	1	2	3	4	5
47. General openness and willingness to look for and adopt new ideas and practice	1	2	3	4	5
48. Commitment, responsibility, purposeful response to events, and learning without direction	1	2	3	4	5
49. Indication to think into the future, work creatively and imaginatively, and initiate new and unique approaches	1	2	3	4	5
50. Mental agility, capacity to think through problems quickly, ability to acquire complex and new skills or orientations with speed, and capacity to think of several things at once or switch rapidly from one problem to another	1	2	3	4	5
51. Awareness of and ability to manage one's own feelings, inclinations and reactions in all situations	1	2	3	4	5
52. Ability to move rapidly between or to link general and specific, theory and practice, and to apply lessons learnt in one situation to a different one.	1	2	3	4	5
53. Other personal skills and qualities:	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

PART II

Against each of the items (a) - (m) below, please put a tick in one of the boxes to show which of the methods you judge likely to be particularly acceptable and successful or particularly unacceptable and unsuccessful, for the professional development of secondary school principals

X Particularly acceptable and successful
Y Particularly unacceptable and unsuccessful
Z No opinion

				For office use
a. Short courses (up to 5 days in all)	X	Y	Z	
b. Long courses (more than 5 days)	X	Y	Z	
c. Non-residential courses	X	Y	Z	
d. Residential courses	X	Y	Z	
e. Group work with other principals	X	Y	Z	
f. Group work involving other staff members	X	Y	Z	
g. Lectures or lecture/discussions	X	Y	Z	
h. Films	X	Y	Z	
i. Role-playing	X	Y	Z	
j. Case studies	X	Y	Z	
k. Use of self development packages programmed instruction courses etc.	X	Y	Z	
l. Personal reading	X	Y	Z	
m. Other methods : please specify	X	Y	Z	
	X	Y	Z	
	X	Y	Z	

Thank you very much

The Educators of Science Teachers : A Forum for Lifelong Education

P.A.Hobden

Background

In the past few years there has been considerable growth in in-service education programmes for primary and secondary teachers. There have been widespread attempts by the various Educational departments to provide workshops, meetings and courses for their teachers. Although departments are taking responsibility for in-service education at these levels, the tertiary area of teacher educators appears to have been neglected.

Universities and colleges are responsible for the initial education and training of teachers. Unfortunately some institutions focus on needs as seen by the institution and often treat the pre-service education as a theoretical discipline, unrelated to the practicalities of the education profession. There does not appear to be any body taking responsibility for the further development and in-service education of teacher educators.

With this situation prevailing, the need to create some form of broad association of science teacher educators across institutions and departments was perceived. With the help of other agencies involved in non-formal education (Science Education Project and Urban Foundation), the Centre initiated a seminar as a first step in a programme for the self development of science teacher educators.

A letter of invitation was sent out to all institutions in Natal/KwaZulu, emphasising the need for good communication between all involved. The desired aim of forming an 'informal association of science teacher educators' was also indicated (see Appendix A).

Overall reaction was very positive with 28 participants representing colleges and universities; urban and rural institutions; English, Zulu and Afrikaans; different cultural groups; non formal agencies and education departments (see Appendix B). The seminar resulted in many participants meeting colleagues for the first time and a recognition of the common problems and needs of the group. An "interim" steering committee was selected to take suggestions from the meeting and facilitate putting them into practice. In particular they were asked to make recommendations on how and what sort of association should be formed.

Aims of the association

The association was formed with the express intention of meeting the needs of and to assist in the professional development of members. It sought to do this in three ways:

- facilitating communication between members
- organising regional gatherings
- sharing, coordinating and developing resources

(see Appendix C).

The members were recognizing the need to be involved in the organisation and planning of their own professional development. To further encourage members to be involved in their own self development, the constitution states that members must 'commit themselves to involvement in the work of the association'. This was an attempt to prevent members attending activities but not gaining the maximum benefit which only occurs with personal involvement.

Initial Activities

The initial seminar in October 1986 concentrated on four areas: communication, projects and resources, in-service training and the way forward. The small group discussions and reports back were most fruitful. Common problems were identified and it was recognised that there were many resources available, especially people resource, which could be utilized once communication between institutions had been improved. It was also surprising to see how critical participants were of their own lack of attempts to improve communication earlier.

The meeting or workshop at Edgewood in March 1987 was the first meeting when all science teacher educators were invited. It was characterised by a very good spirit amongst the fifty participants with many personal friendships and professional relationships being established.

The following meeting at Indumiso in June focussed on some of the real issues of teacher education. The theme was 'improvisation' and participants shared their techniques of using improvised materials for demonstrations, groupwork and individual pupil practical work. Rather than discuss issues the activities were all classroom based and seen to be very useful i.e. the nitty gritty of teaching.

Evaluation

After the initial meeting participants were given an opportunity to provide feedback for the steering committee by completing an evaluation form with three questions.

1. What did you like/find more useful about the meeting?
2. What did you like least about the meeting?
3. If another meeting was arranged, what issues should be dealt with?

Opportunities for communicating with colleagues was by far the most positive response. It was obvious that participants were stimulated by meeting colleagues from colleges and other institutions which they had not even known had existed, and which served communities with which they had no previous contact.

Although the majority did not respond to the question: "What did you like least ...." a number of participants mentioned "the lack of time in making decisions and thinking things through". Perhaps one of our problems is the lack of motivation to generate the time needed for careful reflection on important matters associated with our professional work. However, this was obviously a point that had to be taken into account in future planning.

As far as issues to be dealt with in future meetings, suggestions covered a wide range from "discussing an inter-college fair" to "development of a teaching manual". Issues which were seen as relevant by many were related to "distribution and collection of information" and "to organising regular meetings". Surprisingly there were no comments concerning 'conditions of service or remuneration', topics which always seem to gain prominence in teacher associations.

Two comments which speak for themselves were also made "colleges are a key area in solving educational problems" and "very impressed by this voluntary effort to satisfy our own needs". It seems obvious that the association was on the right track from the beginning.

Future Activities

The last meeting for 1987 will take place at Esikhawini College. This will be the first meeting away from the main centres and the response of members will be interesting. From the beginning fears were expressed that this programme of meetings would only serve the Durban area and neglect the "rural" areas. However an attempt has been made to dispel this fear by giving a "rural" college an opportunity each year to host one of the three meetings planned. It will also give members of the college an opportunity to experience the organisational problems associated with large meetings which many have not experienced.

Future meetings will obviously attempt to address some of the issues raised initially. Not all will be accomplished but most importantly the quality of meeting and member participation will only improve with time.

It is not a predefined programme but rather a long range continuing process with a programme which will emerge with time. It is an instance of life long education. Although it is unrealistic to make long range predictions about the success of this programme, it has every chance of success because the science teacher educators have taken the responsibility for the programme on themselves.

APPENDIX A

Letter of Invitation to Science Teacher Educators

THE SHELL SCIENCE & MATHEMATICS
RESOURCE CENTRE EDUCATIONAL TRUST

Your ref PAH/il

Our ref

When telephoning or calling, ask for

Date October 13 1986

University of Natal
King George V Avenue
Durban
4001

Telephone 811380
Telex 6 21331 SA

P.O. Box 17112
Congella 4013

The Principal

Dear Sir

SEMINAR FOR SCIENCE LECTURERS

The Shell Science and Mathematics Resource Centre Educational Trust based at the University of Natal is involved with the In-Service Training of Science and Mathematics teachers within Natal. One area that we have singled out for special attention is that of communication. We would like to see regular communication between all involved in science teacher training in Kwa Zulu/Natal.

The Shell Science Centre has decided to initiate this "communication" by calling a seminar of science lecturers involved in courses for the training of primary science, general science and physical science teachers.

At this seminar there will be an opportunity for participants to get to know each other, discuss the problems involved in science teacher training and to hear from agencies such as the Shell Science Centre who are actively involved in science teacher in-service training. It is hoped that some form of informal association of science teacher educators could be formed and a project such as the production of a teachers' guide initiated.

You are invited to nominate two lecturers in the fields of physical science and biology for attendance at this seminar. This seminar will be held at the Durban Holiday Inn from 08hr30 to 12hr00 Saturday 25 October 1986.

Please forward your nominations, by telephone, stating name and specialist teaching area to this Centre before 21st October. If no lecturers are able to attend we would also appreciate it if you could inform us.

Thank you in anticipation of your prompt reply.

Yours sincerely

Paul Hobden

Paul Hobden
PHYSICAL SCIENCE COORDINATOR
The Shell Science and Mathematics Resource Centre
Educational Trust

TRUSTEES J.R. Wilson (Chairman), Prof. P. de V. Booysen, The Hon. J.H. Steyn, Dr J.G. Garbers, Prof A.J. Thornton, Dr A. Pitchford

APPENDIX B

List of Institutions, Agencies and Departments involved in Science Teacher Training in Natal/KwaZulu

Teacher Training Institutions

1. Esikhawini College of Education
2. Eshowe College of Education
3. Madadeni College of Education
4. Umbumbulu College of Education
5. Mturuma College of Education
6. Mpumalanga College of Education
7. Amanzimtoti College of Education
8. Applesbosch College of Education
9. Umlazi Inservice Centre
10. Umlazi College for Further Education
11. Indumiso College of Education
12. Springfield College of Education
13. Bechet College of Education
14. Edgewood College of Education
15. Durban Onderwyskollege
16. Pietermaritzburg College of Education
17. University of Zululand
18. University of Durban-Westville
19. University of Natal Durban
20. University of Natal Pietermaritzburg

Agencies and Departments

1. Shell Science and Mathematics
2. Science Education Project
3. Urban Foundation
4. Department of Education and Culture, Kwa Zulu
5. Department of Education and Culture, House of Delegates
6. Department of Education and Training
7. Natal Education Department

APPENDIX C

CONSTITUTION - ASSOCIATION OF SCIENCE TEACHER EDUCATORS

AIMS

The Association of Science Teacher Educators exists to

(i) meet the needs of and to assist in the professional development of those involved in the pre-service and in-service education of science teachers

(ii) promote the professional development of science teacher education.

It seeks to do this by:

- facilitating communication between members
- organising regional gatherings
- sharing, coordinating and developing resources.

MEMBERSHIP

The association is open to all involved in or interested in promoting science (physical and biological) teacher education.

Persons registering as members accept the aims of the association and commit themselves to involvement in the work of the association.

ADMINISTRATION.

1. The affairs of the association will be managed by a committee of 5 persons to be elected by registered members at an annnual general meeting.

   The chairperson of the association will be elected by the registered members at the annual general meeting. The remaining office bearers will be appointed by the committee at their first meeting.

   The committee will have the power to coopt additional members and form sub-committees as required.

   As far as possible the work of the association will be carried out by the members with the committee playing a coordinating and facilitating role.

2. Upon registration members shall pay an annual subsciption fee which will be determined by the members at the annual general meeting.

3. The financial affairs of the association will be managed by a treasurer who will be obliged to present a statement of account at the annual general meeting.

4. Amendment to the constitution of the association will be by majority vote of the registered members at the annual general meeting or at a special meeting called for that purpose.

WINTER SCHOOL REVISITED :

A report about the Shell Science and Mathematics Resource Centre Educational Trust's 1987 Winter School.

Arieh Lewy

Chapter 1. The General Framework of the Study.

Introduction

The Shell Science and Mathematics Resource Centre Educational Trust located at the campus of the University of Natal operates Winter Schools at various central locations of Natal. The Winter School came to serve Standard 10 students, who need instructional support for increasing their chances to succeed in the Matriculation examinations. The Shell Science Centre operates several educational projects for the Black* school population in South Africa, and the ultimate aim of these projects is to raise the educational achievements and to facilitate the entrance of talented Black pupils into fields of science. The success in matriculation examination is one of the preconditions for starting to study science in various institutions of higher education.

Due to the high failure rate of Black pupils in the matriculation examinations in general, and in the science subjects of the examinations in particular, the Shell Science Centre felt a challenge to establish and to maintain various educational frameworks which may contribute to attainment of the above mentioned aim.

The idea of Winter School was not generated by the Shell Science Centre, it rather boarded the bandwagon and made an effort to make the best out of commonly employed fostering programmes in South Africa. It consists of a five day intensive tutoring programme for Standard 10 pupils in the Winter vacation time before they take their matriculation examinations. Experienced teachers try to impart examination related knowledge and experience to students who have not acquired such knowledge and experience during the regular course of their studies. It is their last chance of filling in what they have previously missed.

The Winter School has a long tradition in South Africa. Year after year various public and private institutions operate Winter Schools, and some of the institutions gain considerable profit from this endeavour. The clientele of the Winter School comes from all strata of the South African student population and it is as popular in the White population as in the Black school population.

*The word Black, when capitalised refers to all non-white ethnic groups in South Africa, including the Asian and the Coloured group. If reference is made to black ethnic group, the word is not capitalised.

As already indicated the operation of Winter Schools cannot be considered as the innovation of the Shell Science Centre. The merit of the project is that it brought this educational intervention programme to a disadvantaged population, which, without the arrangements made by the Shell Science Centre could not have gained access to such a programme.

Additionally the Shell Science Centre makes an effort to accumulate experience; scrutinizes alternative ways and methods to improve the quality of the programme of its Winter School; encourages its staff to reveal creative imagination in adapting the programme to the unique needs of the target population, and conducts carefully designed evaluation studies for eliminating emerging programme flaws.

The 1986 Winter School was evaluated by the Centre's team and the report summarizing the evaluation findings contained a series of recommendations for increasing the effectiveness of action (Lewy, Botha and Garrib 1986). The 1987 Winter School made an effort to implement some of the recommendations and the planning of this programme capitalized on the experience of the previous programmes and on the evaluation findings.

The 1987 programme differed from the 1986 programme at least in four significant aspects:

- focus on severely disadvantaged target population
- more stringent criteria of admission
- reduced scope of curriculum offered
- increased community involvement.

Focus on the severely disadvantaged

In 1987 fewer schools received an invitation to participate in the Winter School than in 1986. It was the Centre's policy that schools in the most severely disadvantaged areas only should be invited and, as a result of this decision, schools for Indian population have not been included in the target population. (Nevertheless in Estcourt and Ladysmith a small contingency of Indian students attended the courses).

Stringent criteria of admission

In 1987 only students who studied all three major science subjects i.e. mathematics, science, biology were admitted to the Winter School. The application of such stringent criteria ensured that the participants of the Winter School should be a selected high ability level group of students, since in most schools usually the most able students select these three science subjects.

Reduced curriculum offered

In 1987 the curriculum of the Winter School was restricted to the three science subjects only. In 1986, a fourth subject, English, was also included in the curriculum. The fact that only three subjects were taught in the Winter Schools enabled the tutors to deal with each subject at a higher level of intensity.

Community involvement

Greater freedom was given to the communities and the local school authorities to determine various parameters of the programme. It should be noted here, that while community involvement in itself is extremely important, it seems necessary to work together with communities in structuring the programme rather than merely imposing upon them the burden of decision making, even if some community institutions are eager to take advantage of such offerings.

The Goals of the Evaluation Study

The goals of the 1987 evaluation study were:

1. To provide informative data about major aspects of implementing the programme and to examine whether they are congruent with the contents of the planner.

2. To examine the satisfaction of the clientele with the programme.

3. To examine the stability from year to year of various aspects of satisfaction with the programme.

4. To examine the impact of some population characteristics, which were not examined in 1986, on satisfaction level with the course.

The Winter School Centres in 1987

The 1987 Winter Schools were operated in the four centres described below:

1. Estcourt - students came from the Bergville (KwaZulu) area, and also some Indian students.

2. Ladysmith - mainly black pupils from Mbambithi circuit, but also a few Indian students.

3. Madadeni, an black township in Newcastle area.

4. St Lewis, in Newcastle area admitting students from the Osizweni and Blaauwbosch townships.

Evaluation data was collected in only three of these centres. In the fourth centre, for technical reasons, no data were collected.

The location of the centres on the map of Natal are marked in Figure 1.

Figure 1. Location of centres.

Information about the Winter School population and about the scope of data collected in each centre are presented in Table 1.

Table 1. The population and the respondents

Centre	No. of participants	No. of respondents	% of respondents
Estcourt	160	-	-
Ladysmith	202	131	68
Madadeni	153	138	90
St Lawis	160	104	65

The Questionnaire

The questionnaire used for data collection in 1987 was almost identical to that used in 1986. The changes were of a technical and linguistic nature only.

Due to the similarity of questionnaires the computer programmes developed for data analysis in 1986 needed only minor modification for adapting them to the need of the data analysis in 1987. Consequently the time required for completing the data analysis was relatively short.

Chapter 2. The Results.

The results of the survey are reported in sections:

- The participants of the Winter School 1987
- The socio-cultural climate of the participants' home
- The matriculation subjects of the participants
- Satisfaction of the clientele

The Participants of the Winter School 1987

The 1987 Winter School was operated from the following centres: Estcourt, Ladysmith, Madadeni and St Lewis.

Within the framework of the present survey data was collected only in the last of these three centres.

Data about the distribution of the schools in these centres according to the number of persons coming from a single school are presented in Table 2.

Table 2. Number of schools according to the scope of participants

Persons from a single school	Number of schools at the Centre					
	Madadeni	St Lewis	Ladysmith	All Centres	% of all Centres	% in 1986
1			1	1	4	11
2-5	1	4		5	22	7
6-10	—	2	3	5	22	19
1 - 10	1	6	4	11	48	37
11 - 20		3	1	4	17	35
21 - 30	2	1	1	4	17	11
31 - 40			2	2	9	7
41 - 50	2			2	9	5
51 -						5
All	5	10	8	23	100	100
Average per school	27	10	16	16		19

It should be noted the number of schools contained in the present sample is approximately 40% of the number of schools participating in the 1986 Winter School survey (Lewy, Botha and Garrib 1986). (In the present survey 23 schools participated versus 57 schools in 1986). As indicated in the 1986 survey, it would be desirable to have a relatively large group of participants from a single school in the Winter School. Such an arrangement would facilitate communication with the schools, it also would facilitate considering the particular needs of all groups of students, who received their regular school teaching from a single teacher, and finally, it would also facilitate follow-up activities and extended teaching to all those who, after participating in the Winter School continued their studies in a single school.

Therefore it is of interest to compare the distribution of schools according to the participation in 1986, with that in 1987. In 1986 data was collected from 1067 students who came from 57 schools. The average of pupils per schools who participated in the Winter School was 19. In 1987 the average participation from a single school was 16, a slightly lower figure, but one can attribute a great importance to a difference of such magnitude. Additionally one should pay attention to differences in the pattern of distribution. On one hand, in 1987 only one school was represented with a single student only (versus 6 schools in 1986), but on the other hand in 1987 none of the schools sent more than 50 participants to the Winter School. The reason for this may well be that the schools participating in the 1987 Winter School had smaller student populations than those which participated in the 1986 Winter School, but it may also be that the admission criteria were more stringent in 1987. Indeed, in 1987, the condition of admission was the intent of the student to take matriculation examinations in all of the following subjects: Physical Science, Biology and Mathematics, while in 1986 the condition of admission was more lenient, and those who intended to take matriculation examinations in two of the above mentioned subjects were admitted to the Winter School.

The 1987 admission conditions may better fit the sponsoring agency's overall educational aims. The major concern of the sponsoring agency is to raise the achievements of the Black student population in South Africa, and of focussing on the tutoring of those who study three science subjects for matriculation is more in line with the publicly declared institutional policy than dealing with a less science-studies oriented pupils group, who selected only two science subjects for matriculation examination.

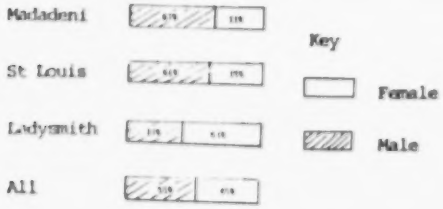
But the price of meeting this institutional goal has been a heavier burden of dealing with a relatively higher number of schools and science teachers.

The comparison of the 1987 student population with that of 1986 also reveals desirable changes. There is a decrease in the proportion of schools sending only a single student to the Winter School. Again, due to the small number of schools it is difficult to say that this change represents a stable organisational trend, or alternatively if it is merely a chance phenomena. Anyhow, one should note this change, and one should emphasise the need to establish clear organisational policy about setting a minimum participation figure for a particular school willing to send students to the Winter School. There is also a need to explore the reasons why that from some schools only a small proportion of students reach the Winter School.

The Gender of the Respondents

In recent years interest has been revealed in increasing the percentage of girls studying science subjects in schools. Science is considered to be a masculine school subject and in general boys are more inclined to study science than girls (Keeves 1973). Therefore it was of interest to examine the proportion of girls in the Winter Schools. Relevant information is presented in Figure 2.

FIG. 2. The gender of the participants, 1987



The data revealed that in two schools the majority of the participants were boys (61% and 67%) and in a third school there were 63% girls. The overall percentage of girls in all three Winter School centres was 45%, approaching a sound balance between boys and girls. Figures are missing with regard to the overall proportion of the girls in the feeder schools, and thus it is difficult to comment on the meaning of the above statistics.

Age of the participants

The regular age of standard 10 students is 17 or 18, i.e. those students, who entered school at the age of 6 and who went through all the grades without repetition are 17 - 18 years old, when they are in standard 10.

Usually, 17 - 18 years old students have the best chance to pass the matriculation examinations, and the ability to reach standard 10 at this age constitutes a proof of their good standing in school. Being older, in general, is not a disadvantage in studying for matriculation, nevertheless in most cases it is associated with encountering some difficulties in the earlier phases of their studies. In the present survey 62% of the students were at the age 17-19. Data about the distribution of pupils at various ages is represented in Figure 3.

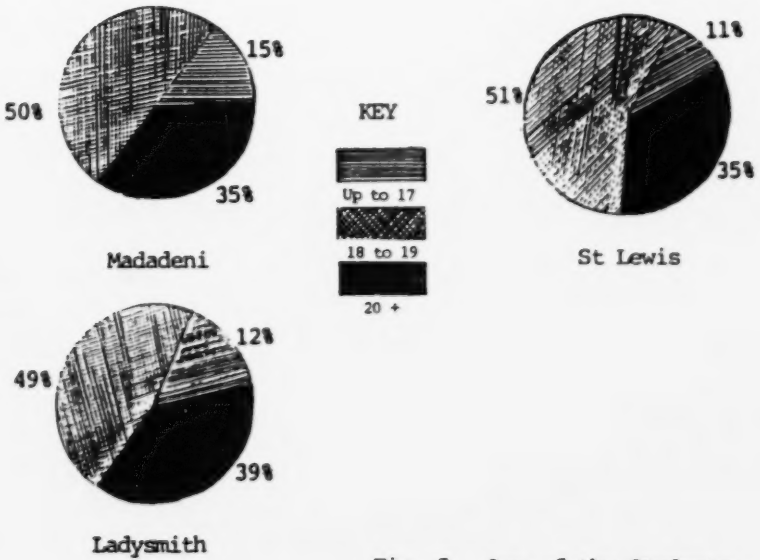


Fig. 3. Age of the Students

It can be seen that a substantial proportion of the students were at the age 19-21 at all centres and the median age is around 19. The frequency of age groups tapered off only after the 21 years old. The participation in the Winter School of older students, too, reflects the fact that within the framework of Black education there is a substantial proportion of above regular age students. It was of interest to find out whether the elder students (those who are above the median-age group, i.e. those who are 20 years or older) are characterised by different traits and behaviours than their younger classmates. Therefore some of the responses collected in the present survey will be examined separately for the 19 years old and the younger one, and for those who are above this age.

The Socio-Cultural Climate of the Participants' Home

The impact of the socio-cultural climate of the home on the ability of school children to cope with school requirement has been convincingly demonstrated in the educational literature (Marjoribank 1979). Therefore an attempt was made to open the services of the Winter School to children from educationally deprived home climates, where parents can provide little support to the children in coping with school requirements. Data was collected to examine whether the participants of the Winter School represent such families. Two types of data was used for this purpose: demographic type (size of family, the parents' level of education and occupation), and information related to the linguistic background of the participants.

The Number of Children in the Family

In many societies the family size constitutes a socio-economic status indicator. High status families have a small number of children and low socio-economic families have more children.

Relevant data about the participants of the Winter School are presented in Table 3.

Table 3. Number of children in the family (percent of respondent/s)

Number of children	Madadeni	St Lewis	Ladysmith	All
1	2.2	1.0	-	1.1
2	3.6	7.7	7.6	6.2
3	13.0	9.6	9.2	10.7
4	15.2	11.5	11.5	12.9
5	15.2	9.6	19.1	15.0
6	15.9	16.3	19.1	17.2
7	15.2	15.4	10.7	13.7
8	8.7	17.3	6.9	10.5
9	6.5	5.8	9.2	7.2
10	2.2	1.9	4.6	2.9
11	-	1.9	0.8	0.8
12	0.7	1.0	1.5	1.1
13	1.4	-	-	0.5
14	-	1.0	-	0.3
All	100.0	100.0	100.0	100.0
Mean	5.6	6.0	5.8	5.8
SD	2.3	2.5	2.3	2.4

According to the data contained in a table 3, approximately 82 percent of the participants' families have at least four children, and in 54 percent of the participants' families there are at least six children.

Parents' Education and Occupation

Table 4 contains information about the parents' education, and table 5 about the parents' occupation. It can be seen that 60 percent of the fathers and 63 percent of the mother have a formal education consisting of standard 5 or less, and only 6 percent of the fathers and 4 percent of the mothers have matriculation or post secondary education.

It should be noted that 28% of the pupils indicated that the father does not live with their family.

Table 4. Parents' Education
(a) Father Education (percentage)

Father's Education	Madadeni	St Lewis	Ladysmith	All
Std 5 or less	54	73	55	60
6 - 8	30	19	29	27
9 - 10	8	4	10	7
Matric	6	3	2	3
Univ. or Post	2	1	4	3
All	100	100	100	100
No Father	33	28	23	28

(b) Mother's Education

Mother's Education	Madadeni	St Lewis	Ladysmith	All
Std 5 or less	61	73	58	63
6 - 8	26	19	37	28
9 - 10	7	4	2	5
Matric	2	1	1	1
Univ. or Post	4	3	2	3
All	100	100	100	100
No mother	6	3	7	5

A comparison reveals that the educational level of parents was higher for the 1986 Winter School population than for the 1987 population. In the 1986 population only 28% of the fathers and 36% of the mothers had an educational level of Standard 5 or less, while the 1987 figures are 60% and 63% respectively. But one should consider the fact that more than 50% of the 1986 Winter School students came from Indian schools and the educational level of the Indian population is substantially higher than that of the black population. Therefore we computed percentage figures separately for the 1986 black population. The figures obtained suggest that the distribution of the educational level of the 1987 Winter School was very similar to that of the black population in 1986.

The distribution of occupations as presented in Table 5 also characterises a low status socio-economic group.

Table 5. The occupation of the parents

Occupations	Father				Mother			
	Madadeni	St Lewis	Ladysmith	All	Madadeni	St Lewis	Ladysmith	All
Professional	2	1	5	3	4	2	2	3
Managerial and Service	15	9	10	11	12	7	3	8
Lower Service and skilled work	34	44	36	37	11	7	8	9
Semi Skilled		4	9	4	1	2	3	2
Labourer	35	29	33	32	14	6	6	9
Domestic					6	13	5	8
Housewife					34	49	72	51
Other	15	13	8	12	18	15	1	11
All	100	100	100	100	100	100	100	100

A high proportion of fathers' work as semi-skilled workers or labourers, or do not live with their families, and a relatively high proportion of mothers are employed as domestic workers and labourers or are unemployed.

Languages Spoken at Home

The utilisation of English in the home of the student is not necessarily a status indicator, but since the medium of instruction, both in the Winter School and in the feeder schools, is English, it is certainly a major determinant of the ability of the learner to cope with the demands of the school.

Table 6. Language commonly used at home

	Madadeni	St Lewis	Ladysmith	All
Zulu	98.6	94.2	93.1	95.4
English	11.6	8.7	15.3	12.1.
Sotho	4.3	4.8	0.8	3.2
Afrikaans	2.9	1.9	-	1.6
Swazi	0.7	1.9	-	0.8
Xhosa	0.7	5.8	0.8	2.1
Tswana	0.7	-	-	0.3

As indicated in table 6, only in 12% of the homes of the participants is English used as the common language of communication.

Table 7. The Status of English in the Family*

Centre	Father speaks English well	Mother speaks English well	Daily Newspaper read at home
Madadeni	13.8 (12.3)	12.3 (15.9)	15.9 (10.1)
St Lewis	7.7 (11.5)	8.7 (15.4)	7.7 (9.6)
Ladysmith	14.5 (16.8)	6.1 (17.6)	15.3 (7.6)
All	12.3 (13.7)	9.1 (16.4)	13.4 (9.1)

* The figures in the cells indicate the percentage of pupils marking the highest possible responses and the figures in paranthesis indicate the second highest response on the scale. Employing a severe standard one should use the upper figures and employing a more lenient standard one should add up the two figures in each cell.

Also, as indicated by the data contained in table 7 only in about 12 - 13% of the families do the parents have a good knowledge of English or read English newspapers regularly.

It can be seen that the language background of the parents, in most cases, provide very little support to cope with the demands of English media schools.

A comparison with the situation in the 1986 Winter School reveals that the English is quite dominant in the homes of the Indian school population, but looking at the comparative figures related to the black population only, no substantial differences were found between the 1986 and 1987 Winter School school populations.

The Matriculation Subjects of the Participants

One of the conditions of admission to the Winter School was extensive studies in science subjects. Only those who intended to take matriculation examinations in Mathematics, Science and Biology have been admitted to the Winter School. Consequently it was of interest to examine whether the participants fulfilled this admission requirement. Table 8 contains information about the subjects which were indicated by the participants as one of their intended six matriculation subjects.

Table 8. Six matric subjects selected by the Participants (peroentage of participants)

Subject	Grade	Madadeni	St Lewis	Ladysmith	All
Accounting	HG	-	1.9	4.6	2.1
Afrikaans	HG	100.0	100.0	96.9	98.9
Afrikaans	SG	-	-	2.3	0.8
Biology	HG	98.6	98.1	90.8	95.7
Biology	SG	1.4	-	-	0.5
Business Economics	HG	-	1.0	-	0.3
Economics	HG	-	1.9	-	0.5
English	HG	100.0	100.0	98.5	99.5
English	SG	-	-	0.8	0.3
Geography	HG	-	-	16.0	5.6
History	HG	-	-	2.3	0.8
Home Economics	HG	-	-	0.8	0.3
Mathematics	HG	94.9	96.2	94.7	95.2
Mathematics	SG	5.1	3.8	3.8	4.3
Physical Science	HG	98.6	90.4	91.6	93.8
Physical Science	SG	1.4	7.7	1.5	3.2
Technical Drawing	HG	-	-	0.8	0.3
Zulu	HG	100.0	99.0	94.7	97.9

HG = high grade
SG = standard grade

If we count the percentage of pupils selecting the higher level or the standard level of a given science subject for matriculation examination, we find that 99,5% selected Mathematics, 97,0% Physical Sciences and 96,2% Biology. Practically, these statistics indicate that the admission conditions were quite severely observed and relatively very few participants have not indicated willingness to take three "science" subjects for the matriculation.

Since the tutoring was carried out in mathematics, physical science and biology only, we limited our comparison with the 1986 data to the proportion of students intending to take matriculation examinations in these three science subject. It was found that in 1986 a smaller proportion of students indicated willingness to take matriculation examinations in the science subjects. The actual figure for 1986 were 89% Mathematics; 44% Physical Sciences and 90% Biology versus 99%, 97% and 96%, respectively in 1987. It seems that the selection procedures in 1987 were more strictly in line with the Shell Science Centre's official policy, than they were in 1986.

Of course one has to remember that the figures of table 8 indicate the declared intents of the respondents. One has to wait for follow up data in order to find out what is the correlation between declared intents and actual behaviour with regard to matriculation examinations.

Satisfaction of the Clientele

Data presented hitherto in this report has been of descriptive type. They provide factual information of what happened. Data of this type may have evaluative implication, too, insofar as they provide information about the congruence between intents related to the programme and its actual implementation (Stake 1967). Indeed in this study the data presented about the distribution of several socio-economic indices and of selected matriculation subjects suggest that the programme intents related to the traits of the target population has been met. The Winter Schools took care of the educational needs of low socio-economic group standard 10 pupils who have lived in an educationally disadvantaged home climate and who nevertheless, have aspirations to take matriculation examinations in major science subjects.

Beyond such descriptive data, the participants of the course were asked directly whether they are satisfied with various aspects of the course. It is true that responses to such questions can not be considered as unobtrusive measure of satisfaction. It may well be that students are grateful that attention has been paid to their needs and are magnanimous enough to pay compliments to those who revealed interest in their needs. This is a phenomenon akin to what Rosenthal (1966) labelled as "experimenter's expectation" bias, i.e. the subject is aware of what the "experimenter" wants to attain and he/she behaves in a way which facilitates the attainment of the experimenter's goals.

Nevertheless, if one collates the responses of the pupils to specific questions with unobtrusive measures of satisfaction, which could be informally observed during the course of the Winter School, it seems legitimate to attribute significance to what the pupils directly indicated. The unobtrusive measure of satisfaction was the attendance of the pupils in the course. They came to the Winter School during their vacation time and the number of students did not decrease day after day, but quite contrarily, in most cases the message of the Winter School spread in townships and day after day more pupils came to attend the lessons. One may say that the satisfaction expressed by written responses was endorsed by attendance.

As to the direct questions related to the satisfaction Table 9 contains information about the percentage of respondents who gave the highest possible response to ten questions which examined reaction to the Winter School.

Table 9. Percentage of highly positive responses to various questions

Serial Number in Questionnaire	The Question	Centres			
		Madadeni	St Lewis	Ladysmith	All
28	Very useful	96.4	96.0	93.1	95.1
29	Better understanding	57.4	63.9	48.1	55.7
30	Study for exam	65.4	70.3	66.4	67.1
31	Confidence	61.8	58.8	42.9	53.8
32	Receive answer	63.0	78.8	57.4	65.5
33	Like school	86.1	81.4	74.6	80.3
34	Like sessions	88.4	86.4	76.3	83.6
35	Others liked	92.0	87.3	80.2	86.5
36	Understand lessons	69.6	58.8	45.8	58.2
37	Others understand	59.1	57.0	51.1	55.6

It can be seen that to most questions a very high proportion of the pupils gave the highest positive reaction.

As a practical confirmation of the credibility of the student responses may serve the fact that there are substantial differences across questions with regard to the proportion of persons marking a highly positive response. To some of the questions (like question no.28) almost all students gave a highly positive response, while to other questions (like question no. 31) only approximately half the respondents gave a highly positive response. This pattern response speaks against the view that the respondents exhibited a full compliance to everything that happened in the Winter School. They are more generous in giving positive responses to general questions (e.g. "was useful") than to specific ones (e.g. "gave better understanding").

It seems that understanding is still a problem, and one cannot be fully satisfied with the results if only 58 percent of the respondents claimed that they always understood the lessons well. There is a need for a deeper look and a more thorough clinical examination as to what do such responses mean and what happened to those who claimed they did not always understand the lesson.

Since 10 questions contained direct evaluative statements about the Winter School, an attempt was made to construct a Likert-type scale from these questions. The reliability of the scale (Cronbach's coefficient alpha) was .677.

The mean score and standard deviations attained on this ten item scale is presented in Table 10.

Table 10. Attitude toward the Winter School

Gender	Statistics	Centres			
		Madadeni	St Lewis	Ladysmith	All
All	Mean	26.8	26.6	25.4	26.3
	Standard deviation	2.7	3.1	3.0	3.0
	Number of cases	138	104	131	373
Male	Mean	27.0	26.1	25.1	26.3
	Standard deviation	2.7	3.2	3.5	3.1
	Number of cases	92	64	49	205
Female	Mean	26.6	27.5	25.5	26.3
	Standard deviation	2.9	2.6	2.8	2.9
	Number of cases	46	40	82	168

The statistics contained in table 10 suggest that no differences were found between boys and girls as well as between various centres with regard to the level of satisfaction of the participants. Also, no substantial difference were found between the statistics related to the satisfaction measures obtained in 1986 and those obtained in 1987.

Two other questions which have implications for future planning deserves attention - one of the questions asked what subject they would prefer to study in the Winter School, if only one of the subjects offered could have been selected. The responses are summarised in Table 11.

Table 11. One subject tutoring

Subjects	Centres			
	Madadeni	St Lewis	Ladysmith	All
Physical Science	25.4	52.9	26.0	33.2
Biology	25.4	6.7	38.9	24.9
Mathematics	48.6	37.5	30.5	39.1
Others	0.7	2.9	4.6	2.6

Interestingly enough centres differ from each other with regard to the preference of a particular subject. The Madadeni pupils "vote" for Mathematics, in Ladysmith Biology received the highest proportion of votes and in St. Lewis, Physical Science is the most popular subject. Are these differences in reaction to various subjects a result of teachers' behaviour at the Winter School, or alternatively do they represent predispositions due to experiences in the school before entering the Winter School? Answers to these questions would require further studies.

The second question deals with preferences of organisational arrangements. The results are presented in Table 12.

Table 12. Preferences for organizational patterns

Recommended Organization	Centres			
	Madadeni	St Lewis	Ladysmith	All
1 ½ per day	0.7	5.8	10.7	5.6
4 ½ per day	2.2	3.8	6.1	4.0
As it is	97.1	90.4	83.2	90.3
All	100.0	100.0	100.0	100.0

It can be seen that the "as it is" response is overwhelmingly dominant. The clientele identifies itself with the intuition of the planners.

The problem dealt with in this question is a real one, and the alternatives offered are realistic ones. This is a typical question which could be answered better through small scale experimentation than through a single and highly reactive question posed to inexperienced pupils.

The Reaction of the Winter School of Regular Age and Over-Age Students

As indicated above almost 40% of the Winter School participants were over-age students, i.e. they were above the age of 19. One may assume that these older students have a different attitude to their studies in general, and to the Winter School in particular than the regular age students have. Therefore we decided to examine separately the reactions to the Winter School of students belonging to these two age groups. The 1986 study has not addressed itself to this question and it seemed appropriate to extend the framework of the study and to examine issues which have not been treated previously. The relevant summary is presented in Table 13.

Table 13. The satisfaction level of students from various age groups

Attitude scale item	Age		All
	-19 years	20+ years	
Winterschool was very useful to me	95.2	94.9	95.1
Gained very much better understanding of some topics	53.3	59.7	55.7
Gained very much knowledge how to study for exams	66.1	68.9	67.1
Gained very much greater confidence in my knowledge	52.6	55.8	53.8
Gained very much receiving answers to questions	65.2	65.9	65.5
Gained very much by liking school better	79.6	81.5	80.3
Liked very much the way sessions were run	84.5	82.1	83.6
Winterschool liked very much by other pupils	86.6	86.4	86.5
Almost always understood lessons in course	58.0	58.6	58.2
Think pupils almost always understood lessons in course	52.9	60.1	55.6
I am not sorry I came to this course	97.8	97.1	97.6
Scale mean	26.2	26.5.	26.3
SD	3.1	2.9	3.0
Number of cases	233	140	373

It can be seen that the pattern of responses to various aspects of the Winter School do not differ across age groups. The older students as well as the regular age students have higher ratings on items which deal with the general aspects of the course (e.g. the Winter School was very useful) than on those which deal with specific aspects of the course (e.g. understood lessons). One may say that age differences do not affect the reaction of the students to the Winter School and it is quite likely that the benefit derived from the programme is equal for both age groups.

Chapter 3. Summary, Conclusions and Recommendations

The 1987 Winter School of the Shell Science and Mathematics Resource Centre Educational Trust differed from that operated in 1986 with regard to several aspects of the programme. In 1987 only pupils from severely disadvantaged schools were invited to participate and also only those who intended to take the matriculation examination in all three major science subjects were admitted. Accordingly, in 1987, the scope of the curriculum became more limited and following the policy of the centre, the tutoring was restricted to science subjects. Finally, the 1987 Winter School is characterised by a relatively greater community involvement. The particular centres enjoyed a greater autonomy in selecting the participants and to structuring the programme.

Unlike in the previous year, the 1987 Winter School did not have students from the Indian school system.

As in 1986, also in 1987, an evaluation survey was carried out with the aim of describing characteristic features of the programme examining the level of satisfaction of the participating standard 10 pupils and identifying aspects of the programme which should be modified.

The survey was carried out in three of the four centres operated in 1987 and the findings are based on the responses to the evaluation questionnaire of 373 participants.

The Implementation of Planned Programme Changes

The decisions taken by the Centre management to open Winter Schools only in highly disadvantaged areas, and also to limit the scope of the curriculum have been structural features of the programme and their implementation has been fully accomplished through buresucratic procedures of budget allocation.

The admission conditions i.e studying the major science subject for matriculation examination were almost fully realised. In 1987 almost all participants (96%) studied Physical Sciences as a matriculation subject versus 44% in the previous year. Mathematics appeared as a matriculation subject of all students (99,5%) versus 89% in the previous year, and Biology was marked by 97% of the students versus 90% in 1986. The data revealed that the strictest control can hardly prevent the "infiltration" of several students to the course who do not meet the formally set admission requirements. Nevertheless the level on congruence between announcement and its realisation is quite impressive.

As to the community involvement and school autonomy it would be desirable to collect more precise documentation. Autonomy exists only if communities and school can take advantage of it and become involved in deliberations as a basis of decision-making. Arbitrary decisions made by some school authorities does not necessarily represent a desired pattern of autonomy.

The data revealed that the great majority of the participants' families were characterised by traits which usually constitute indicators of low socio-economic status. In approximately 82% of the families there are at least four children, and the median family size is 6 children. 60% of the fathers and 63% of the mothers have an education which does not exceed Standard 5, and only about 13% of the families read English newspapers regularly. The socio-economic indicators were higher in the total population of the 1986 Winter School, but it should be remembered that in 1986 a large proportion of the participants came from the Indian school system. The socio-economic indicators of the black group in 1986 is not substantially different from those observed in 1987.

Almost half of the participants are girls. In this respect the findings are quite encouraging. One frequently hears complaints about the lack of interest of girls in studying science subjects. The Winter School succeeded to attract a large proportion of girls.

The Satisfaction of the Participants

The participants of the Winter School expressed a high level of satisfaction with the studies. At all centres where Winter Schools operated, one could observe a pressure on behalf of the students to gain admission to the studies. Those who were admitted manifested a high level of perseverance and the day-to-day attendance was increasing rather than decreasing.

Highly positive responses were given to most questions dealing with satisfaction with the course.

There were items (i.e. the course was useful) to which 95% of the respondents marked the highest positive response. It is interesting to note that the responses were more positive to items which dealt with the merits of the course in general terms (i.e they were useful, I liked them) than to those which dealt with specific aspects of the course, such as understanding what was taught or gaining confidence. The questionnaire contained three items which referred to various aspects of understanding and the proportion of highly positive responses given to these items were much lower than to other items (50% - 60%). One may say that the absolute value of the figures is still high, but the comparison of responses with responses given to other items has quite likely more informational value than the absolute figures describing the response pattern. It seems that understanding what is taught in the classes is the "Achilles heel" of the courses.

One may assume that the students' responses are biased and they tend to describe their attitudes in terms of superlatives but the response pattern (i.e which items obtain a very high rating and which one obtains a lower level rating) is free from such bias and therefore it provides information of a relatively high level of validity.

The Stability of Course Characteristics

Despite the organisational changes introduced in the 1987 Winter School one could observe a high level of stability across 1986-87 with regard to several major features of the courses. As already indicated the socio-economic indicators of the black population revealed a pattern of stability. The majority of students came from families which can provide little support to the children in their studies. As revealed by the data of 1986 as well as of 1987, at least four variables related to the family background of the students explain why the parents provide little direct help in the studies of their children. Firstly, in a great proportion of the families (28%) the father is absent. Secondly, the parents do not have a knowledge of English, or have only a relatively low level of knowledge of English. Thirdly, the educational level of the parents is relatively low. Only 13% of the fathers and 9% of the mothers indicated that they have an education level higher than standard 8. Fourthly, the number of children in the family is relatively high. In 54% of the families there are at least 6 children.

Of course this does not mean that the parents cannot provide support of great value to their children. One should not underestimate the value of the emotional support and the encouragement of the parents. Indeed one may assume that most of the pupils who succeeded to pass lower classes and reached the standard 10 level have enjoyed strong support from their family during the years of their study in the school. But the family cannot provide tutoring in subjects where the pupils encounter difficulties and therefore the Winter School serves as a factor which complements the family support by providing a particular service to the pupils, which the family is unable to supply.

There is a stability also in the level and in the pattern of satisfaction of the participants with the Winter School. Beyond the gratifying information derived from the responses about the overall satisfaction level of the students, both in 1986 and 1987 one may find indication in the response pattern that a substantial proportion of the students have difficulties in comprehending what is taught. Of course, in face of the high level of failure of the matriculation examination of black students, one may be content if the tutoring may increase the chances of the best students to pass the examination. Nevertheless in face of differences in the ability level of students entering the course one may consider the possibility of carrying out some kind of ability grouping within the framework of the Winter School. An ability grouping of the students could be based on school marks or on a brief entrance examination or on a combination of both of these methods.

Finally a moderate pattern of stability was observed with regard to the distribution of schools according to the number of their students registering for the Winter School. In 1986 as well as in 1987 one could find schools from which more than 40 students came to the Winter School and also schools from which only a single student reached the Winter School.

Very little is known about the circumstances which brings a single pupil from a whole school to the Winter School, about social absorption of students who do not have peers from their own class in the course and about the benefit such pupils gain from their studies. The Winter School is based on agreement of the organising body with schools and not with individuals and therefore the problem of individual participation should be seriously examined.

The Age of Students and Satisfaction with the Course

The present study has examined the relationship between the student's age and the level of satisfaction with the course.

The 1986 report has not touched upon this issue, and therefore addressing this question may broaden our knowledge about reactions to the Winter School. The data summaries revealed that the pattern of reaction to the Winter School has not differed across various age groups of students. Those who are older (above 19 years) have the same views about the Winter School as their younger peers.

Recommendations

The recommendations presented in the concluding section of this report refer mainly to the preparation of the course and to the evaluation of its effectiveness. It is only partly based on the findings discussed in this report. Another source of these recommendations was the reaction of the programme planners to the Winter School and their views and opinions concerning the need for additional information in order to be able to improve the programme.

Expanding the Scope of Joint Planning with Schools

The Winter School was organised on the basis of joint planning of the Centre management with the school authorities. In 1987 a trend was felt to increase the participating schools autonomy in making decisions about admission policy and some aspects of the curriculum. It is recommended that delegation of responsibility for various aspects of the programme into the hands of school authorities and communities served by the schools be continued, but the Centre management should demand that schools should justify their decisions and should demonstrate that the decisions were made according to certain agreed upon procedures. The justification of decisions implies reference to conditions prevailing in the school and it should be required that statements made about the local conditions should be supported by convincing evidence.

Evidence should be provided also about procedural aspects of decision making within the school. One can hardly accept the legitimacy of autonomy representing arbitrary decisions of the school principal. Those who enjoy autonomy should be required to demonstrate they employ an adequate mechanism of decision making and are able to involve all interested parties in the decision making process.

More Information about the Feeder Schools and their Students

Another aspect of joint planning is obtaining more information from the feeder schools and students eligible for admission and actually admitted to the Winter School. The Shell Science Centre should move toward a way of organising Winter Schools in a way which differs from the operational mode of typical Winter School operated in South Africa. Being a non profit organisation it could afford to establish a higher level of personal contact with the student, obtain information about the students before they enter the Winter School and carry out a certain kind of follow up to find out what happens to them after leaving the Winter School. This may require more investment and further limitation in the number of students coming to the Winter School, but such actions may improve the effectiveness of the studies. It may well be that changes should be introduced gradually and on experimental basis only, probably parallel with the traditionally run Winter School patterns.

In more specific terms it is suggested that before the beginning of the Winter School activities some entry tests of achievement status tests should be administered to all eligible applicants to the Winter School. The tests should examine mastery in basic skills such as Mathematics, English language skills, Scientific Reasoning etc. Also schools should be asked to provide information about previous school grades of the students in various subjects.

Information of this type may serve as a basis for planning the course content, grouping the applicants or selecting students for the Winter School.

More information should be given to the schools about the specific content to be taught in the Winter Schools and the participating schools may be asked to teach certain prerequisite topics, which are needed for ensuring the effectiveness of the Winter School teaching.

As already indicated it is not suggested that the whole scope of the Winter School should be built on such intensive cooperation with schools, but at least, some schools should participate in such joint planning activities. The pay-off of such joint planning should be examined later and then decisions can be made whether such activities contribute to improving the outcome of the Winter School.

Curriculum Imbedded Feedback

The planners of the Winter School should obtain feedback about the day to day progress made by the students during the period of the Winter School. Looking at the responses to the questions about understanding the topics taught at the Winter School it seems that a great proportion of the students do not understand the explanations.

It would be useful to administer short 4 - 6 minute quizzes for the students at the end of a particular lesson, examining to what extent the students comprehended what was taught. The administration of the quiz should not be considered as an assessment activity, but rather it should be considered as a learning activity embedded into the course of the studies. Curriculum embedded feedback was used successfully in previous evaluation studies,both for monitoring the teaching learning and for adapting instructional materials to the needs of the learner[1]. The tests could be administered according to a pattern which is known as matrix sampling, which means that not all students respond to all test items[2]. In a brief period of about 4 - 6 minutes three different versions of 2 - 3 items test could be administered. If some items will be common for two different tests, an individual would have to respond to three items only (i.e. to one version of the alternative tests) and the planners could obtain information about 7 - 8 different items.

A curriculum embedded feedback would not disturb the course of a lecture, moreover it may prepare students for test taking situation, which is one of the major purposes of the Winter Schools.

1. The term "curriculum embedded list" was used by the Individually Prescribed Instruction project of University of Pittsburg. It is discussed more intensively in an AERA monograph on curriculum evaluation (Lindwall and Cox 1970).
2. Matrix sampling refers to a technique of two dimensional sampling: sample test items from a longer test and sample student who will respond to a particular set of items (Husek and Sirotnik 1968).

Follow Up after Students

The planners of the Winter School obtained information about the quality of the Winter School in terms of scope of attendance and the satisfaction of the participant. But since the aim of the project is to prepare the students for mastering the requirements of the Matriculation examination, it seems very relevant to obtain information as to whether the students sat for the examinations, and whether they passed the examination. Even if methodologically it may be difficult to determine what the contribution of the Winter School to the success of the students in passing examination, it is of great informational value to find out whether they passed the examinations or not. Gradually it would be necessary to find strategies which may indicate what the unique contribution of the Winter School was to its success, but the first step should be to build in a follow up mechanism into the project. Again, it is not suggested that all participants of the forthcoming Winter School should be included in a follow up design. It may be of value to collect such information from the schools or directly from the examination authorities about a selected sample of the students.

It may also be of value to prepare a follow up questionnaire in which the participants could respond to items dealing with the quality of the course in a retrospective way after completing their matriculation examinations. Such retrospective evaluation of learning experiences by alumini is frequently used for evaluating courses in institutions of higher education (Braskamp 1984), and they may be successfully used also by matriculant students.

Boarding the Bandwagon and Improving it

The Shell Science and Mathematics Resource Centre Educational Trust boarded the South African bandwagon in installing the Winter Schools at various centres of educationally deprived black population. During the few years of operating such projects, it accumulated experience and it developed a framework, which on the basis of the reaction of clients of various types, the pupils, the management of the feeder schools and community people of the feeder townships, the teachers and the planners directly responsible for conducting the teaching, i.e. all the stakeholder of the programme consider as satisfactory.

The satisfaction consensually expressed by various clientele groups may easily tempt the programme management to continue exactly in a way they operated hithertoo. But it should be emphasised that in the domain of educational enterprise as well as in other domain of social actions, there are no limits for improvement and a project which does not continuously improve may loose the momentum of its action. The 1986 evaluation report of the Winter School contained a recommendation to introduce small scale "planned variations" into the programme,

evaluate them and further develop those "variation type" which seems to promise great success. As concluding comment to this report it seems adequate to repeat this recommendation. It applies also to the evaluation design, as to the framework of organising the Winter School and operating it.

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Evaluating the Quality of Instructional Material in the Mathematics Component of the Curriculum Extension Programme (CEP)

Dexter V Luthuli

Background

The instructional materials used within the framework of the Mathematics component consist of worksheets developed at the Centre by the Coordinator of the Mathematics studies. The worksheets cover various topics specified in the school syllabus and also topics of enrichment. Great emphasis is put on including in the worksheets assignments and exercises, which may raise the learners' interest in the subject and which may increase their liking for Mathematics.

It is expected that a considerable proportion of the work sheets used by the students will be in the form of self guided learning activities or in the form of cooperative small-group learning activities. The tutor's role, in such context, should be monitoring the learning activities, helping those individuals, or groups, who encounter problems and providing feedback as to whether the solutions are correct.

Accordingly the classroom setting is also informal, students are seated in a way which enables interaction among themselves.

The work sheets have been based on the writer's expectation of what students can perform and what they may find interesting. Nevertheless one cannot take for granted that the expectations of the writer will be met in reality. The developers of instructional materials frequently encounter disappointment in finding out that the students have difficulties in coping with the instructional materials presented to them. Therefore it was decided to closely observe how the Mathematics worksheets are used in the class. Are students able to solve problems presented in the worksheet? Is sufficient time allocated for working on the Mathematical problems? Do students enjoy the work?

While answers to these questions can be given on the basis of information collected through questionnaires, it seemed to be more useful to arrange direct observation of classroom activities and to examine how the students get along with the worksheets.

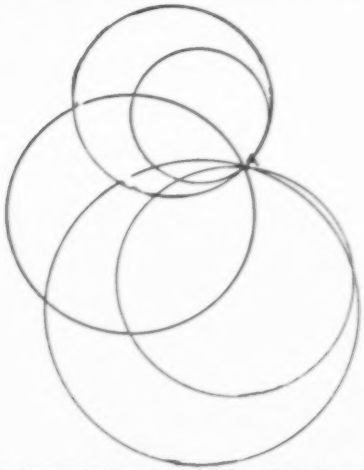
The present report contains a description of class activities observed while the students were working on a problem in geometry and on a problem in algebra.

The classroom occurrences and the conclusions reached on the basis of the observations will be described separately for the two mathematical topics.

An assignment in geometry

One of the worksheets contains assignment in Geometry as presented in exhibit 1.

1. Draw any circle of radius not longer than 3 cms. Make the outline of this circle bold, by retracing the circumference, if necessary. Choose any point A on this circle. By choosing different centres on the circumference of this circle and adjusting radii so that each circle passes through A, draw many circles.



The envelope of these circles is called a CARDOID. Cardoid means heart-shaped. The point A is called the cusp of the cardoid and the circle with which we start is called the base circle.

Exhibit no 1. An assignment in geometry

Observing the classroom occurrences it was found that the students encountered difficulties representing psychometric, linguistic and logical defects.

Psychometric difficulties

Most students had difficulties in correctly using the compasses for drawing circles. The implication of this finding is that exercises should be given to the students on how to use the compasses and also attention should be paid that the instruments used by the students are of a quality which facilitates the adequate accomplishment of the assignments.

Linguistic difficulties

The linguistic difficulties were of two types : vocabulary and the structure of the paragraph. As to the difficulties in vocabulary they did not understand the words "bold" or "retrace" in the sentence and consequently they could not carry out this instruction. Difficulties emerged also in understanding the newly defined terms : CARDOID and CUSP. It may be useful to find some mnemonic aid for these two words, for example to refer to better known deviates of the Latin translation of "heart"; "cardiology".

The paragraph structure was also difficult. The instructions appear in very concise language which is quite common in Mathematics textbooks, nevertheless there is a need to use a more redundant language for the particular group of learners who participate in the CEP group.

Logical difficulties

The task assigned to the students required a very meticulous execution of sequentially ordered steps. Failure to carry out one step in this sequence made it impossible to correctly execute all subsequent steps. To overcome this difficulty it was advisable to break down the assignment into subsequent steps, and to build a feedback mechanism, which might help to check the correctness of each step and to enable the student to correct flaws before proceeding to the next step.

The specification of the following steps may reduce the severity of the logical difficulties encountered by the students:

1. Draw any circle of a radius not longer than 3 cms. Check whether the radius is really less than 3 cms. What is the exact length of the radius you have chosen?

2. Make the outline of the circle bold, (i.e. thick). You may have to retrace (draw over again) the circumference of this circle in order to make it bold.

3. Mark a point A on this circle. Choose any other point on the circumference of the circle and with this new point as centre, draw another circle which passes through point A.

   Now you should have two circles on your page. One is drawn in bold (thick) lines, the other one is drawn in lighter lines.

4. Select a second point on the circumference of the bold circle (the first one which you drew) and with this point as centre, again draw another circle, which passes through point A.

   Make sure that the last circle you drew has its centre on the bold circle.

These are first steps of the assignment. The subsequent assignment components should also to handled in such a manner. There should also be a clear indication that there is a need to draw approximately 20-30 circles till the CARDOID pattern is observable.

An Assignment in Algebra

The Algebra assignment presented in exhibit 2 is an example of a series of assignments which aim to sharpen the pupils' awareness of patterns which may constitute a basis for solving a problem in algebra and the explanation of why the pattern works.

Study the following pattern and complete. Check your answers by factorization and by direct calculation. Can you give an explanation why this works?

$2^2 - 0^2 = 4 \times 1 = 4$

$3^2 - 1^2 = 4 \times 2 = 8$

$4^2 - 2^2 = 4 \times 3 = 12$

$5^2 - 3^2 = 4 \times 4 = 16$

.
.
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.
.
.

$17^2 - 15^2 = 4 \times \ldots . =$

Now find : (i) $101^2 - 99^2$

(ii) a and b if $a^2 - b^2 = 4 \times 4983$

Exhibit 2. An assignment in algebra

While most pupils were able to continue the lines of the computation exercise and were also able to verify the correctness of the calculation, the observation of their working pattern suggests that the goal aimed at by setting this exercise has not been attained. Little awareness of the pattern was observable, rather the students operated by carrying out the full calculations of the results.

No wonder that they could not answer the question presented at the end of the exercise. The students were expected to deduce that

$$(n + 1)^2 - (n - 1)^2 = 4n \quad \ldots\ldots\ldots\ldots (1)$$

which is the general equation for explaining the results.

A difference was found between various pupils handling this exercise. Some pupils made the calculations directly from the numbers recorded without dealing with the factorizations. Other pupils dealt with the factorization, but even they have not derived the result (1). It is expected that result (1) is to be arrived at by observing instances of the pattern and generalising these to the nth case where difference between $n + 1$ and $n - 1$ is always 2 and then finding the difference of squares between $n + 1$ and $n - 1$ by multiplication or factorisation.

These observations suggest that there is a need to provide more explanation about the purpose of the exercise, and probably to put this exercise into a series of other exercises, which have a common goal, viz. to create awareness of pattern and the principle on which the results are based. A series of exercises which contain gradually increasing complexity of patterns may lead toward the attainment of this goal.

Concluding Remarks

The present report illustrate the importance of observing the way instructional materials of various types are used in the CEP as well as in other programmes. The observed classroom events provided basis for formulating suggestions to modify instructional materials. This report contains observation records related to two exercises of the Mathematics component of the CEP. The fact that in both cases, suggestions to modify the programme emerged, constitutes proof that there is a need to systematically examine all programme components in actual classroom situations. The evaluation literature refers to such evaluation mode as formative evaluation (Scriben 1967) and the observation described here demonstrates the necessity and the utility of an activity of this kind. Conducting formative evaluation contributes not only to the improvement of a particular set of instructional materials, but it also provides orientation to the programme writers about the complexity and difficulty of instructional materials which fit the level of readiness of particular target population.

Programme writers may benefit from such activities insofar as they develop an awareness of difficulties students may encounter in using instructional materials. Thus formative evaluation is useful not only for eliminating flaws in the instructional materials, but also education programme writers to produce better instructional materials.

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Entry Knowledge in Communication Skills of the Participants of the Curriculum Extension Programme (CEP)

A Ziervogel

Background

In 1987, a group of approximately 150 Standard 8 students selected from 14 schools in the Durban area were invited to participate in a tutoring programme called CEP (Curriculum Extension Programme). The pupils were selected by their school principals and subject teachers on the grounds that they were their top achievers in mathematics and science. The pupils and their parents were keen for them to participate. The general framework of the programme consists of two hours tutoring sessions three times a week on Monday, Tuesday and Wednesday afternoons. The tutoring is provided in small groups of approximately 10 students and the subjects of the tutoring are :- Physical Science, Mathematics and Communication Skills in English.

The purpose of the tutoring is to increase the chances of the pupils to pass Matriculation Examinations in the subjects of the tutoring and on the basis that their communication skills will be improved, to increase their chances of success in all other subjects as well.

On the basis of experience accumulated in the Shell Science and Mathematics Resource Centre Educational Trust project, a short period of tutoring provided during a five day Winter School, or during a one year Saturday tutoring session is not sufficient to ensure the success of the participants in the matriculation examination. Therefore it was decided to introduce a tutoring programme of a three year duration with the hope that the prolonged contact with the students will facilitate the establishment of an adequate learning climate, and will meet the learning needs of each individual and provide almost individualised supplementary remedial teaching. This may reduce the accumulated achievement deficits of all learners.

The Population

The participants on the course are drawn from 14 feeder schools in the Durban area viz. Umlazi, Lamontville, Chesterville, Wentworth, Kwa Mashu, Newlands East and West. The distribution of pupils from the feeder schools is reflected in Table 1 below:

Table 1. Number of pupils per school

Number of Pupils per school	Number of Schools
6 - 10	10
11 - 15	4
All	14

As indicated in Table 1 only 4 schools were represented by more than 10 pupils. The range of minimum - maximum pupils from a school was 7 - 13.

This distribution can be considered as an ideal since the programme planners wished to recruit small groups of 8 - 12 pupils from an individual school. A group of this magnitude enables the tutors to maintain contact with the school teachers and adapt the programme to the needs of the pupils coming from each particular school.

Table 2. Gender of pupils on course

Male	Female
55%	45%

Type of School

The feeder schools can be divided into two large groups viz. those where English is the pupils' home language and those where English, although the official medium of instruction in the schools, is not the pupils' home language. As indicated in Table 3 there are 3 schools in the first group and 11 schools in the second group.

Table 3. Types of school in programme

Home Language	Schools	Percentage of pupils
English is pupils' home language	Fairvale Newlands West Newlands East	21
English is Second Language	Ogwini Igagasi KwaShaka Zwelibanzi Zakhe Isibonelo Chesterville Lamontville Zeph Dhlomo J L Dube Ngabakazulu	79
	All	100

The English for Specific Purposes (ESP) Component of the Programme

Curriculum

The aim of the ESP component is to provide pupils with a basic competence in English language which will give them the 'tools' to tackle the concepts and language of Mathematics and Science.

The problem does not lie in the acquisition of the technical terms peculiar to Mathematics and Science as these compose only ±9% of the language used in the subjects. Besides, technical terms, despite their appearance which may be initially off-putting, are easy to understand as they have a particular, precise meaning which does not vary. The problem lies with the acquisition of everyday English which the pupils must attain in order to understand the concepts presented to them, to communicate their ideas and to solve problems.

Two thirds of the Standard 8 pupils in this programme use English as a Second Language and their command of the language varies from very poor to reasonable at best. In two of the centres, viz. Swinton Road Technical College and V N Naik School for the Deaf, English first language pupils are mixed with the Second Language users. These latter pupils are fluent - some extremely so in the use of English.

Problems have been experienced with the two mixed first and second language speakers in finding material which will extend all pupils who operate at several vastly different levels. The practical solution would be to separate pupils into groups based on English language competence but this has not been done, as we are trying to offer non-formal education in a non-apartheid setting. The alternative may be in identifying the right material and activities for use in lessons.

During the first semester tutors used the Sached 'Read Well'(1) and 'Write Well'(2) material; two language books which teach underlying competence in reading and writing. The tutors supplemented these with additional material of their own, articles from the New Scientist and as much oral interaction as they could. The tutors in the two centres where first and second language pupils are mixed became very frustrated as they felt they were not doing their best to extend either group of pupils.

The format of the lessons has been changed for the second semester in an effort to obviate these problems. The individual lessons are based on different group activities at which pupils can work at their own pace. (See below).

Activities

Each of the roughly 151 pupils has two hours of English per week. The programme for the individual sessions is as follows :

1. Read Well G. Cretchley and J.Stacey publ. Sached Trust & Ravan Press 1986.

2. Write Well G. Cretchley and J.Stacey publ. Sached Trust & Ravan Press 1986.

Dictated piece
Dictations are given from the book "Successful Science" Standard 8 by P Broster and H Jones (3). This book was selected from others as it is readable; the language used is easy to comprehend and it was possible to select a paragraph of general interest from each section. Eight pieces have been selected, related to the different sections of work the pupils will cover. Pupils are given the punctuation and difficult names such as Dimitri Mendeleev are written on the board. The piece is marked by the tutor and discussed with the pupils the following week.

Grouped Pair Activities
The pupils break up into pair to tackle individual tasks.

Pair Games
These tasks can only be accomplished through the oral interaction between a pair of pupils, as each of the pair is only given half the information required to complete the task. The tasks include activities such as ice breakers, questionnaires, information transfer, simulations, role plays etc. They are enjoyable and the pupils like doing them.

Index card games
One or two pairs of pupils can play these games at one time. Each game consists of 30 cards, with categories of words, e.g. antonyms, synonyms, idioms, etc. The cards are shuffled and turned on their backs where they are numbered from 1 to 30. The pupils are required to make pairs by recognising the cards and remembering the location of the cards. A master card with the 15 matched pairs is included in each pack for pupil reference.

'Read Well'
Pupils tackle the chapters in this book individually or in pairs. The first section of this book is designed to teach pupils comprehension skills in reading.

'Write Well'
Pupils tackle the chapters individually or in pairs. The first section of this book is concerned with building sentences.

Second Language pupils enjoy 'Read Well' and 'Write Well' but the First language pupils are not challenged by these books, particularly 'Write Well'. We are looking for a more challenging First language grammar book to use with first language pupils.

Oral with tutor
The tutors take one or two pupils each session for oral discussions. Each tutor has been supplied with a small portable tape recorder and blank tapes to use in oral work.

In addition, each pupil is given a copy of Sached 'Upbeat' magazine, a teenage oriented magazine, each month. It contains articles of general interest, of specific interest to this age group, letters from

3. Successful Science P.Broster and H.James Publ Oxford University Press 1985.

readers, quizzes etc. The pupils enjoy the magazine and it is used as a basis for oral work.

A 'lending library' has been placed in each Centre to encourage pupils to read. Most of the books are graded for the second language readers and vary from simple to advanced. Non-graded readers have been placed in the two centres where first language pupils are present.

Oxford English Dictionaries are available for pupil use in each centre. The pupils have their own dictionaries which they use to enter 'new' words they come across in any of the lessons, together with the meaning of the word.

Tutors also provide their own material to extend or interest their pupils. This varies from one tutor to another.

Establishing the Entry Behaviour Level of the Students

In order to evaluate the entry behaviour level of the students a language skills test was produced. The test consisted of three parts, each examining the pupils' achievement levels in a different aspect of communication skills, viz. spelling and punctuation on a dictated piece, comprehension of the dictated piece and general vocabulary (refer to appendix A).

Spelling and Punctuation

The spelling and punctuation component consisted of approximately 150 words dictation. The text was taken from a Standard 7 textbook from the topic 'Light'. The particular piece dealt with the problems of seeing coloured objects. The text can be described as a scientific type of prose.

The text was read to the pupils, repeated slowly in units (pre-determined so that all tutors paused at the same points) for them to take it down and then repeated once more to give the pupils a chance to correct their writing.

Comprehension of the Text

The text of the comprehension test was the same as the previously read to the students as a spelling and punctuation test dictation. The text was given to the pupils in a printed form. Eight multiple choice questions dealing with the text examined the level of reading comprehension of the respondents.

The questions examined whether the reader had understood specific information provided in the text and whether he/she had understood the vocabulary used in the text. The pupils had covered this section of work at the end of their standard 7 year in 1986. None of the questions required the reader to make inferences beyond what was

explicitly stated in the text. The test items thus reflected lower cognitive abilities (Bloom 1956)(4).

Vocabulary

Twenty four multiple choice items contained words which are used in everyday context and in a precise scientific context. The words selected would appear in a Standard 8 pupil's regular reading assignments within the framework of his/her school activities.

The multiple choice questions in which the word appeared followed three formats viz.

(a) one word synonyms without context (3 examples)
e.g. Tabulate can mean:
A. increase
B. work out the answer
C. write a report
D. arrange in columns.

(b) the word appears in a precise scientific context in the stem (11 examples)
e.g. The light dispersed as it passed through the glass. This means the light:
A. disappeared
B. was focussed
C. was scattered
D. was brighter

or

(c) the word appears in an everyday situation (11 examples)
e.g. The perfume has a characteristic smell. This means that the smell was:
A. strong
B. unlike any other smell
C. almost unnoticeable
D. pleasant.

Results

Spelling and Punctuation

The scores given to the students were awarded in a way that a score of 10 meant that no spelling or punctuation errors were encountered. For each spelling or punctuation error a half point was deducted from the score. Pupils who had 20 or more errors received a score of 0.

4. Bloom B.S. Taxonomy of Educational Objectives : The Cognitive Domain New York, Mackay 1956.

The distribution of the spelling and punctuation scores are reported in Table 4 below.

Table 4. Spelling and punctuation scores.

Score	% of pupils attaining score
10	4,5
9	15,0
8	18,8
7	10,5
6	6,8
5	7,6
4	3,8
3	6,8
2	5,3
1	3,8
0	17,3
All	100

Mean = 55
SD = 35
N = 133

Examples of spelling errors commonly made by the pupils :

Light : ligh, lat, late, lage, large, line, lines, eyes

White : whaite, what, why, light, watt

Appear : upyear, apear, pear, on piyer, appeared

Coloured : coled, couler, coulored, coulered, coulet, coulared

Transparent : transpirint, transparrent, transparanth, transperent, transperect

Reaches : reachest, reacheas, reches, recheas, rechease, riches, riched, rities

It appears that pupils who incorrectly spelled word did so phonetically. This was possibly influenced by the fact that the tutors on the CEP programme do not pronounce their words in the same way the pupils' school teachers do.

Exhibits 1 and 2 contain facsimiles of a good and a very weak dictation.

The variation in spelling is very large. 6 students received perfect scores in spelling and 23 students received a score of zero.

Exhibit 1. A good dictation

Listen as your tutor reads a passage. Your tutor will read the passage through once. Your tutor will then read the passage so that you can write it. Write the passage in the space below. Then your tutor will read the passage once more.

Coloured Objects

We live in a world where most of the light source ~~enters our eyes~~ give off light that is more or less white. Why do so many objects appear coloured to us? When we see objects, what light from those bodies enters our eyes? If an object is transparent, the light that reaches us has been transmitted through the body. If an object is opaque, the light that reaches us has been reflected from the surface of the body. If white light shines through a blue filter, only light of a blue colour reaches our eyes. What happens to the rest of the light? It must be absorbed by the filter. If white light shines onto a blue sheet of paper, only the blue light is reflected into our eyes. The rest of the light is absorbed by the paper.

9/10

Exhibit 2. A very weak dictation

Listen as your tutor reads a passage. Your tutor will read the passage through once. Your tutor will then read the passage so that you can write it. Write the passage in the space below. Then your tutor will read the passage once more.

Color objects

An object is opaque if the light is prevented from passing through it. We see opaque objects because light from them enters our eyes. An object is transparent if light can pass through it. We can see clear objects because light from them enters our eyes. An object is translucent if light can pass through it but we cannot see clear objects through it. When we look at a piece of white paper, we see white light. White light is a mixture of all colors of light. When white light shines through blue filter, only blue light comes out. When white light shines on blue paper, what happens?

Comprehension

The comprehension test turned out to be quite easy for the students. The distribution of the responses to each of the 8 items are presented in Table 5.

Table 5. Percentage of responses by pupils to Comprehension Questions

Question	Percentage of pupils				
	omitted question	chose A	chose B	chose C	chose D
1	2	4	7	(83)	4
2	-	3	(92)	3	2
3	1	5	2	-	(92)
4	4	30	23	(36)	7
5	2	1	(96)	-	1
6	-	-	5	(93)	2
7	3	31	6	3	(57)
8	-	-	3	(96)	1

(The correct response is ringed)

Question 4 was answered incorrectly by most of the pupils (64%)

An example of an opaque object is a:
A. thin piece of paper
B. piece of glass
C. brick
D. glass of water.

As the second most popular answer was B, it seems reasonable to assume that most pupils (64%) did not know the meaning of the word opaque.

The second question which was answered incorrectly by a large number of pupils (43%) is 7

White light is made up of
A. red, blue and green wavelengths
B. blue, indigo and violet wavelengths
C. red, orange and yellow wavelengths
D. all of the above.

The larger percentage of the pupils who answered this question incorrectly chose B - for some reason this portion of the spectrum appears to be more familiar to them than the others.

Vocabulary

The vocabulary test contained a broad range of item difficulty levels. The easiest item (item no 6) attracted 95% correct responses and the most difficult one (item 15) was answered correctly only by 10% of the respondents. The distribution of the responses to each item is presented in Table 6.

Table 6. Percentage of Correct Responses by Pupils to 24 Vocabulary Questions

Question	Percentage of pupils				
	omitted question	chose A	chose B	chose C	chose D
1	4	44	20	22	10
2	-	4	38	42	16
3	1	54	32	9	4
4	3	47	4	31	15
5	2	14	58	4	22
6	-	95	-	4	1
7	1	18	50	5	26
8	-	20	22	53	5
9	1	19	2	71	7
10	-	21	16	50	13
11	-	24	24	46	6
12	-	15	23	6	56
13	5	44	22	16	13
14	3	11	52	23	11
15	3	10	41	26	20
16	3	7	24	7	59
17	3	18	9	48	22
18	2	3	86	2	7
19	7	29	55	5	4
20	9	8	42	38	3
21	8	23	22	8	39
22	7	11	57	11	14
23	7	4	11	59	19
24	7	10	68	5	10

Questions which caused problems are presented below:

1. The pupils burst into spontaneous laughter.
   This means their laughter was :
   A. very loud
   B. a natural impulse
   C. difficult to stop
   D. steady

Most pupils (44%) selected the distractor A. very loud. As spontaneous is incorrectly used by most school pupils in a scientific sense, the item examined the use of this word in an everyday setting. The distractors A and C were obviously too close to the pupils concept of the word and will have to be changed if the test is used again.

11. The police have a theory about the murders.

This means that they had :
A. views about the murder
B. facts about the murder
C. methods to solve the murder
D. solved the murders

Distractor C was too attractive to the pupils. They may have confused the words theory and theorem. In mathematics a theorem involves steps to validate a particular statement or theorem. The steps may have been equated with methods.

15. The players felt that their teams had the best probability of winning the soccer cup.

This means the best:
A. likelihood
B. chance
C. experience
D. possibility

The stem proved to be a poor one; the pupils probably associated probability and winning with chance and winning and selected distractor B. The stem will have to be changed if the question is used again.

Achievement in Three Language Skills

An attempt was made to divide the pupils into three groups according to their level of achievement in three language skills. The results are presented in Table 7.

Table 7. Achievements in Three Language Skills

Level	Spelling Punctuation	Comprehension	Vocabulary
Good	49%	58%	25%
Weak	25%	35%	33%
Very weak	26%	7%	42%
All	100%	100%	100%

It can be seen that in spelling and comprehension approximately half the students obtained good scores while in vocabulary only one quarter of the students had such good results. It appears that the items included in the vocabulary test were very difficult for that particular group.

Differences between Schools

In order to obtain information about the differences of achievement level of pupils in various feeder schools of the CEP, separate statistics were prepared for each school. Separate statistics were also produced for the group of schools where English is the First language of the majority of students and for schools where English is a Second Language.

The relevant information is presented in Table 8.

Table 8. Achievements in various schools

School	No of Pupils	Spelling Punctuation		Comprehension		Vocabulary		Total Test	
		X	SD	X	SD	X	SD	X	SD
Newlands West	10	80	11	90	10	84	11	85	7
Newlands East	7	86	7	93	6	79	6	86	2
Fairvale	11	88	9	87	12	81	10	86	5
J L Dube	13	10	16	79	11	36	8	42	6
Ngabakazulu	8	70	15	90	11	49	10	70	8
Zeph Dhlomo	7	25	25	80	16	37	12	48	15
Zakhe	11	35	27	74	18	39	18	50	18
Isibonelo	10	42	28	75	8	49	9	56	11
Chesterville	12	39	27	78	9	36	14	51	13
Lamontville	8	40	27	62	21	37	14	47	15
Kwashaka	8	67	42	70	22	37	11	58	22
Igagasi	10	55	35	80	12	51	15	62	16
Ogwini	9	84	31	85	5	59	15	76	14
Zwelibansi	9	68	31	87	6	47	13	68	12
English 1st Language	28	85	9	89	10	82	9	85	5
English 2nd Language	105	47	34	78	14	43	14	56	17

As indicated by the summaries of table 8 schools differ considerably from each other with regard to the range of achievements. In comprehension the range of averages is 62-90 percent of correct responses and in vocabulary the range is 36-84. The highest differences appear in spelling and punctuation, where the range is 10-86. The within school differences are also very high in spelling. In several schools the majority of students received a zero score in spelling and punctuation.

Table 8 contains information about the group statistics in the Total Test. The score Total Test is based on the average percentage score a person attained on the three skills tests. One may distinguish a high achieving school group (average above 80), a middle achieving group (average 60-80), and a low achieving group (average below 60). Seven schools pertain to this weak group.

The Evaluation of the CEP 1987

In order to assess the utility of the English for Special Purposes component of the Curriculum Extension Programme an evaluation study will be carried out by the Shell Science Centre. While it can be claimed that the utility of the programme should be assessed on the basis of its contribution to the matriculation examination success, nevertheless it seems preferable to collect interim data and to employ a continuous, ongoing evaluation of the programme, rather than focussing on a single end of course evaluation. Since the CEP is scheduled as a programme of three year duration interim evaluation summaries will also be produced at the end of the first and the second year of operating the programme.

The evaluation will focus on describing the programme participants, the process of programme implementation and the interim progress made by the students.

In operational terms the following data types will be collected during the first year of operating the programme.

The Participants

A questionnaire will be administered by the students with the aim of collecting information of biographical type and about the socio-economic and linguistic background of the pupil's family. The school marks of the students in English, Physical Science and Mathematics will be recorded.

The Implementation of the Programme

The implementation of the programme will be examined in the following ways:

(1) Report about learning activities - The tutors are requested to prepare a report about class activities. These reports contain a detailed description of the content covered and of the activities carried out. The report sheets will be summarised separately for each study group and for the whole project.

For the sake of easy coding it is suggested that each report should contain the specification of the contents, learning activities, and tutor initiatives.

(2) Class visits - Reports prepared by the programme leader in the classes. The report will describe the class climate including the interest and the participation level of the students, the quality of instructional materials used, and the quality of teaching.

Attendance

Records will be kept on students' attendance of classes. An attempt will be made to determine reasons of drop-out from the class, and if possible, intervention will be made on behalf of the project to prevent the final drop out of students from the course.

The attendance information pertaining to a particular student will be recorded on a single sheet containing a clear identification of the person.

Tests and Examinations

At the end of the year tests will be carried out in all major language skills.

(1) Reading comprehension - The test will contain three short reading passages with 4-5 multiple choice items for each of the passages.

(2) Vocabulary - The test will contain 10-12 vocabulary items.

(3) Listening comprehension - One short passage will be read out to the students and following the reading a set of 4-5 multiple choice questions will be presented to the students examining whether they understood the message of the text read to them.

(4) Writing - The students will be asked to accomplish one or two short writing assignments. The teachers will mark these assignments.

(5) Oral communication - Insofar as possible a formal oral communication test will be given to the students in the form of personal interview, conversation, formal presentation or group discussion.

Where such testing cannot be carried out for the whole group of course participants, it will be carried out for one group of students, or for 2-3 persons from three selected groups of students.

The teachers will prepare a recoding of these tests, and will assign scores to the students.

APPENDIX A

PROPOSED VOCABULARY AND CONCEPT EXERCISE

FOR STANDARD 8 CEP PUPILS

Page 1.

VOCABULARY EXERCISE

Pupil's Name .....

DICTATION

Listen as your tutor reads a passage. Your tutor will read the passage through once. Your tutor will then read the passage so that you can write it. Write the passage in the space below. Then your tutor will read the passage once more.

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Pupil's Name .....

Pupil's School .....

Pupil's Tutor .....

Read the passage that follows and then answer the questions about the passage. In each of the questions you will be given four possible answers. Choose the correct answer and circle the corresponding letter.

For Example

The day after Sunday is:

A. Tuesday
B. Monday
C. Saturday
D. Wednesday

Note: B. was circled, because it is the correct answer.

COLOURED OBJECTS

We live in a world where most of the light sources give off light that is more or less white. Why do so many objects appear coloured to us?

We see objects when light from those bodies enters our eyes. If an object is transparent the light that reaches us has been transmitted through the body. If an object is opaque, the light that reaches us has been reflected from the surface of the body.

If white light shines through a blue filter, only light of a blue colour reaches our eyes. What happens to the rest of the light? It must be absorbed by the filter. If white light shines onto a blue sheet of paper, only the blue light is reflected into our eyes. The rest of the light is absorbed by the paper.

Science Focus 7 Ayerst et al

1. A light source:

   A. reflects light
   B. absorbs light
   C. gives off light
   D. transmits light

2. A transparent object:

   A. reflects light
   B. transmits light
   C. absorbs all the light
   D. absorbs the blue part of the light

3. We see objects when:

   A. light from the object reaches us
   B. light is absorbed by the object
   C. the object is black
   D. light from the object enters our eyes

4. An example of an opaque object is a:

   A. thin piece of paper
   B. piece of glass
   C. brick
   D. glass of water

5. If white light shines through a blue filter we see:

   A. white light
   B. blue light
   C. red light
   D. no light

6. If white light shines through a red filter we see:

   A. white light
   B. blue light
   C. red light
   D. no light

7. White light is made up of:

   A. red, blue and green wavelengths
   B. blue, indigo and violet wavelengths
   C. red, orange and yellow wavelengths
   D light of all colours

8. If white light shines onto a piece of blue paper we see:

   A. red light
   B. white light
   C. blue light
   D. no light

VOCABULARY SECTION

In each of the questions which follow, you will be given four possible answers. Choose the correct answer and circle the corresponding letter.

---

1. The pupils burst into spontaneous laughter.

   This means their laughter was:

   A. very loud
   B. a natural impulse
   C. difficult to stop
   D. steady

2. The maximum temperature yesterday was 26°C. This means the temperature was:

   A. always higher than 26°C
   B. an average of 26°C
   C. never above 26°C
   D. between 25°C and 27°C

3. The light rays were incident on the prism. This means the rays were:

   A falling into the prism
   B joining the prism
   C splitting the prism
   D highlighting the prism

4. If two images coincide they appear to be:

   A overlapping
   B. distinct
   C. separate
   D. identical

5. A plane mirror can invert an image. This means the image appears:

   A. erect
   B. upside down
   C. bent sideways
   D. in front of the mirror

6. Sir Isaac Newton let sunlight fall onto a triangular glass prism. The light which passed through the prism is called a spectrum. In this spectrum Newton saw:

   A a rainbow of colours
   B black and white bands
   C only two colours
   D alternating red and green bands

7. The perfume had a characteristic smell. This means that the smell was:

   A. strong
   B. unlike any other smell
   C. almost unnoticeable
   D. pleasant

8. The initial step of the recipe involved adding sugar to the margarine. This means the sugar was added:

   A. carefully
   B. last
   C. first
   D. quickly

9. The painter had to immerse his brushes in turpentine to clean them. This means he:

   A. wiped his brushes with turpentine
   B. splashed the turpentine onto the brushes
   C. put the brushes into turpentine
   D. dripped the turpentine onto the brushes

10. The pupil used the results of his experiments to classify the compounds. This means the pupil:

    A. was able to identify the compound
    B. wrote a good report of his experiments
    C. was able to put the compounds into groups
    D. made a table of results for each compound

11. The police have a theory about the murders. This means that they had:

    A. views about the murders
    B. facts about the murders
    C. methods to solve the murders
    D. solved the murders

12. The scientist was the first person to isolate the element. This means he:

    A. used it in his experiments
    B. found out what it was made of
    C. found out where to find it
    D. separated it from other substances

13. Component can mean:

A. part of the whole
B. all of the parts
C. compound
D. the largest part of the whole

14. The globe emits red light. This means it:

A. absorbs red light
B. gives out red light
C. reflects red light
D. cannot give out red light

15. The players felt that their team had the best probability of winning the soccer cup. This means the best:

A. likelihood
B. chance
C. experience
D. possibility

16. Tabulate can mean:

A. increase
B. work out the answer
C. write a report
D. arrange in columns

17. The light dispersed as it passed through the glass. This means the light:

A. disappeared
B. was focussed
C. was scattered
D. was brighter

18. When the girl was asked if she wanted a new dress her answer was negative. This means-

A. yes
B. no
C. possibly
D. maybe

19. The two families lived in adjacent houses. This means they were:

A. opposite one another
B. next to one another
C. in different streets
D. in different areas

20. Concept can mean:

A. difficult
B. idea
C. method
D. new work

21. Omit can mean:

A. include
B. give off
C. see clearly
D. leave out

22. The scientist was able to interpret the results of his experiments. This means he was able to:

A. find the mistakes in his results
B. explain the meaning of his results
C. write down his results
D. repeat the experiments to get new results

23. The light rays converged on the surface. This means they:

A. changed
B. moved apart
C. moved closer
D. were reflected

24. The scientist decided to substitute copper for iron in his experiment. This means he would:

A. use iron and copper
B. use copper instead of iron
C. increase the amount of iron
D. decrease the amount of copper